DOCUMENT RESUME

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ABSTRACT

Included in this group of newsletters, produced by the ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, are issues produced during the 1970-1973 period. These newsletters contain information concerning center activities and publications and other items considered of interest to researchers and educators of various educational levels. The 10 newsletters contained in this grouping reflect the growth of the center's scope and activities and show that mathematics was added to science education as a center concern in March, 1970, with environmental education being officially added in August, 1970. Seven of the 10 newsletters in this grouping are for science education only, with mathematics education and environmental education items being included in the separate newsletters of each of these divisions. The last issue in this group, Vol. 5, No. 2, was the last that will be printed. (PEB)

SMAC

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ED 095004

Center Comments

Effective March 1, 1970 this center became the Center for Science and Mathematics Education.

Dr. F. Joe Crosswhite, Associate Professor in Mathematics Education at The Ohio State University, has been named Associate Director for Mathematics Education. Mr. James Gates, Executive Secretary for the National Council of Teachers of Mathematics, and Dr. Phillip Jones, Professor of Mathematics at The University of Michigan have been named to the Advisory Board. We believe they will provide effective leadership and consul in developing the program in mathematics education.

During 1970 we will be actively acquiring documents in science and mathematics. We request the assistance of both science and mathematics educators in helping us to continue to build an outstanding resource collection in science education and to help us build an equally strong resource collection in mathematics education.

We will be developing research reviews in mathematics education as we have in science education. If you have suggestions for topics for the research reviews in either science education or mathematics education we would appreciate your comments.

With the continued development of the program in science education and the new program in mathematics education we look forward to the future of the ERIC system and this center with enthusiasm. In our next newsletter we will provide information regarding another interesting development, computerized searches of the documents in the ERIC collection. Such searches will be possible within the next few months and make documents in the ERIC system easier to identify and easier to obtain.

Back Copies of RIE Available

Research in Education, prepared by ERIC, is a monthly abstract journal announcing recently completed research-related reports and current projects in the field of education. National Standards Association, Inc., has reprinted in one volume the Report Résumés which appeared in the first 14 issues of **Research in Education**, ending December, 1967. There are 2,349 documents abstracted in this volume with identification numbers ED 010 000-012 348. Those interested in any one of these documents should read the abstract to determine whether they want to read the full text.

Report Résumés are designed for school administrators, teachers, researchers, information specialists, professional organizations, and students.

Copies of Report Résumés are available for immediate delivery and are sent postpaid. Price: $24.50 a copy. Indexes to the Report Résumés are contained in the Annual Index 1967. Contents include author indexes, institution indexes, subject indexes, and accession number list. Price: $3.25 a copy.

If you wish to receive the Report Résumés and the Annual Index 1967, the total cost is $27.35. Both may be ordered from:

National Standards Association, Inc.
1321 Fourteenth Street, N. W.
Washington, D. C. 20005.

Audiovisual Catalog Available

The National Audiovisual Center has issued a catalog listing more than 3,000 Federal Government motion pictures and filmstrips. Films for sale are listed by subject. A variety of films are available including some related to the space program. For information contact James Gibson, Director, National Audiovisual Center, National Archives and Records Service, Washington, D. C. 20408.

SE 017 935

Audiovisual Materials to Explain ERIC Available

Dr. Allen Lee and his colleagues of the Teaching Research Division of the Oregon State System of Higher Education have developed a set of three filmstrips and an accompanying record to explain the ERIC System. The filmstrip set includes:

(1) **An Introduction to ERIC** . . . provides an orientation to the ERIC System and illustrates ERIC and clearinghouse products and services.

(2) **How to Use ERIC** . . . shows how to search the indexes, use the résumés and read ERIC documents . . . illustrates a simple search.

(3) **ERIC Advanced Training Program** . . . uses the Thesaurus to illustrate a more complex and comprehensive search.

The ERIC record is monaural. On Side 1 is the sound script for **Introduction to ERIC** and on Side 2 the sound script for **How to Use ERIC** and **ERIC Advanced Training Program.** Both sides of the record carry an inaudible "beep." When an automatic record player-projector is utilized, the inaudible "beep" on the record actuates the projector to synchronize the record with the filmstrips. There are at least two brands of equipment which can be used: a **Dukane** Micromatic Model 14A390E and a **Viewlex** Table Talk Model TT. Equipment, which does not have the capability for picking up the inaudible "beep," may also be used. In such cases the filmstrips can be advanced manually by an operator using a copy of the script as a guide. The timing indicator for each frame on the filmstrips is underlined in red in the narrative section of the script. The cost of a complete set of three filmstrips and accompanying record is $5.00. They can be ordered from:

National Audiovisual Center (NAC)
Washington, D.C. 20409

Upon request the same presentation can be obtained in a slide tape format for approximately $30.00 from:

Dr. Allen Lee
Teaching Research Division
Oregon State System
of Higher Education
Monmouth, Oregon 97361.

ERIC Products Available SMAC

SMAC General Bibliography Series

The Science and Mathematics Education Information Analysis Center periodically prepares a set of ten bibliographies. Each one summarizes the documents processed within one or more of the primary subject categories since the last set of bibliographies was prepared. Therefore, Bibliography 20 is an update of Bibliography 10 and Bibliography 30 is an update of Bibliography 20. Three sets of bibliographies are currently available; a fourth set is being prepared for release.

Instructional Procedures (1)
ED 015 877 MF-0.50 HC-3.30

Teacher Education (2)
ED 015 879 MF-0.25 HC-2.35

Equipment and Materials (3)
ED 015 880 MF-0.50 HC-3.15

Curriculum (4)
ED 017 473 MF-0.50 HC-6.10

Achievement (5)
ED 015 878 MF-0.25 HC-1.80

Teacher Resource Materials (6)
ED 021 772 MF-0.50 HC-4.65

Science and Society
History of Science Education
Science History, General Studies and Surveys (7)
ED 021 771 MF-0.25 HC-1.50

Legislative Acts and Reports
Administration and Supervision
Science Facilities (8)
ED 021 766 MF-0.25 HC-0.75

Evaluation and Educational Objectives
Learning Theories and Processes
Research Methodology (9)
ED 021 774 MF-0.25 HC-1.75

Teacher Characteristics
Student Characteristics (10)
ED 021 773 MF-0.25 HC-0.95

Instructional Procedures (11)
ED 026 277 MF-0.50 HC-3.40

Teacher Education (12)
ED 026 278 MF-0.25 HC-1.80

Equipment and Materials (13)
ED 026 279 MF-0.50 HC-4.05

Curriculum (14)
ED 026 280 MF-0.50 HC-6.00

Achievement (15)
ED 026 281 MF-0.25 HC-1.45

Teacher Resource Materials (16)
ED 026 282 MF-0.50 HC-4.75

Science and Society
History of Science Education
Science History, General Studies and Surveys (17)
ED 026 283 MF-0.25 HC-1.70

Legislative Acts and Reports
Administration and Supervision
Science Facilities (18)
ED 026 284 MF-0.25 HC-0.90

Evaluation and Educational Objectives
Learning Theories and Processes
Research Methodology (19)
ED 026 285 MF-0.25 HC-2.55

Teacher Characteristics
Student Characteristics (20)
ED 026 286 MF-0.25 HC-1.35

Instructional Procedures (21)
ED 030 772 MF-0.50 HC-3.00

Teacher Education (22)
ED 032 441 MF-0.25 HC-1.90

Equipment and Materials (23)
ED 032 442 MF-0.50 HC-4.50

Curriculum (24)
ED 032 443 MF-0.50 HC-6.35

Achievement (25)
ED 032 444 MF-0.25 HC-1.40

Science and Society
History of Science Education
Science History, General Studies and Surveys (27)
ED 032 445 MF-0.25 HC-1.45

Legislative Acts and Reports
Administration and Supervision
Science Facilities (28)
ED 032 446 MF-0.25 HC-0.95

Evaluation and Educational Objectives
Learning Theories and Processes
Research Methodology (29)
ED 030 781 MF-0.50 HC-3.50

Teacher Characteristics
Student Characteristics (30)
ED 030 782 MF-0.25 HC-1.15

Articles

Articles, published in periodicals, analyze research in various areas of science and mathematics education and indicate implications of research for teaching of these respective subjects. The articles listed are available through EDRS. (Other articles have been published but are not yet available through EDRS).

An Analysis of Research
on Instructional Procedures
in Secondary School Science,
Part I—Outcomes of Instruction
Robert W. Howe & Gregor Ramsey
ED 026 287 MF-0.25 HC-0.50

An Analysis of Research
on Instructional Procedures
in Secondary School Science,
Part II—Instructional Procedures
Gregor A. Ramsey & Robert W. Howe
ED 027 233 MF-0.25 HC-0.65

An Analysis of Research Related
to Instructional Procedures in
Elementary School Science
Gregor A. Ramsey & Robert W. Howe
ED 027 232 MF-0.25 HC-0.70

An Analysis of Research Related
to the Education of Secondary
School Teachers
Patricia E. Blosser & Robert W. Howe
ED 025 444 MF-0.25 HC-0.55

Research Reviews

Research Reviews analyze and synthesize research related to science and mathematics education over a period of several years. Reviews for 1963-64 and 1965-67 have been completed. As these reviews are available through EDRS they will be announced in the SMAC Newsletter. (Reviews for 1968-69 are currently being prepared.)

Science Education Information Reports
Research Review Series—Science Paper 1
A Summary of Research in Science Education
For the Years 1965-67, Secondary Level
Paul Westmeyer And Others
ED 034 913 MF-0.25 HC-1.90

Occasional Papers

Occasional Papers, issued periodically, indicate implications of research for science and mathematics teaching. These are being developed in response to requests for information. Two papers have been developed related to inservice education.

Science Education Information Reports
Occasional Paper Series—Science Paper 1
Inservice Education For Teachers of Secondary
School Science
Patricia E. Blosser
ED 034 912 MF-0.25 HC-2.75

Science Education Information Reports
Occasional Paper Series—Science Paper 2
Inservice Education For Teachers of Elementary
School Science
Patricia E. Blosser
ED 036 680 MF-0.50 HC-3.00

Special Bibliographies

Special bibliographies are also prepared to provide information related to requests received at this Center.

Science and Mathematics for
Young Children
An Annotated Bibliography
(Special Bibliography 1)
Francis Case Theiss
January, 1964—June, 1969
ED 033 259 MF-0.25 HC-1.75

Research Reporting Sections

The SMAC staff compiles abstracts of research papers presented at certain educational conferences and coordinates these abstracts into Research Reporting Sections of each meeting. Abstracts of the papers presented at the 1969 meeting of the National Association for Research in Science Teaching (NARST) are available from EDRS. Abstracts of papers presented at the 1970 NARST meeting will be available later.

National Association for Research
in Science Teaching, 42nd Annual
Meeting, February, 1969.
New Approaches to Science Education Research
Abstracts of Presented Papers
ED 027 227 MF-0.50 HC-4.65

Ordering Information

Documents can be ordered from ERIC Document Reproduction Service (EDRS), National Cash Register Company, 4936 Fairmont Avenue, Bethesda, Maryland 20014. Be sure to include the document number (ED number) when ordering. MF indicates the microfiche price and HC indicates the hard copy price. Be certain to indicate the form of the document (MF or HC) you want.

Special Clearinghouse Packages are Available

Standing orders for the ERIC microfiche packages are encouraged. Microfiche for selected documents processed by this clearinghouse and announced in **Research in Education** can be obtained on a quarterly basis by placing an order with the ERIC Document Reproduction Service. The cost of a standing order is approximately $55.00 per quarter. Order information is listed below:

(1) Order from:
ERIC Document Reproduction Service
National Cash Register Company
4936 Fairmont Avenue
Bethesda, Maryland 20014

(2) The ERIC Document Reproduction Service is registered to collect sales taxes. Orders from states which have sales tax laws should include payment of the appropriate tax or tax exemption certificate.

(3) Purchase letters or letter orders will be accepted. Individuals should send payment with the initial order to establish an account. Continuing automatic distribution of Standing Orders will be made with billing at time of shipment.

(4) **Foreign Orders:** A 25 percent service charge, calculated to the nearest cent, must accompany orders from outside the United States, its territories, and possessions. This service charge is applicable to all orders.

CIJE Being Expanded

Current Index to Journals in Education (CIJE) has been expanded to include more than 500 educational publications—journals, quarterlies, annuals, and yearbooks. Beginning with the January, 1970 issue, CIJE contains annotations of many articles to outline the scope and substance of the article.

Publications currently being reviewed for CIJE, of special interest to readers of this Newsletter, include the following:

1. The American Biology Teacher
2. American Journal of Physics
3. The Arithmetic Teacher
4. Australian Science Teachers Journal
5. Biology and Human Affairs
6. BioScience
7. Educational Studies in Mathematics
8. Environmental Education
9. Geotimes
10. Impact of Science on Society
11. Journal of Biological Education
12. Journal of Chemical Education
13. Journal of Engineering Education
14. Journal of Geological Education
15. Journal of Outdoor Education
16. Journal of Research in Science Teaching
17. The Mathematics Teacher
18. Mathematical Gazette
19. Mathematics Teaching
20. National Council of Teachers of Mathematics Yearbook
21. Physics Education
22. The Physics Teacher
23. Physics Today
24. Science
25. Science and Children
26. Science and Society
27. Science Education
28. The Science Teacher

The subscription rate for CIJE (monthly) is $34 a year. The **Index** plus semi-annual and annual cumulations are $64 a year. Cumulations may be ordered separately.

Subscriptions, requests for a sample copy, or requests for information should be sent to:

CCM Information Corporation
909 Third Avenue
New York, New York 10022

ERIC Publications Available

To assist our readers in using the ERIC System, we are including a list of publications produced by ERIC Central and the ERIC Clearinghouses.

A number of publications are available from the U. S. Government Printing Office, Washington, D. C. 20402. These include the documents listed.

1. **Research in Education,** ERIC's monthly announcement journal.
   - $21.00 domestic, $26.25 foreign; for 12 issues per year.
   - Contains abstracts and author, institution, and subject indexes for the 1,000 new documents added monthly to the ERIC collection.
2. Cumulative indexes for **Research in Education.**
   - **Research in Education,** Annual Index—1967 Reports, $3.25.
   - **Research in Education,** Annual Index—1967 Projects, $1.50.
   - **Research in Education, Report Résumé Index,** January-December 1968, $8.25.
3. Indexes to special ERIC collections (all documents in each collection can be purchased in microfiche as a complete set from: ERIC Document Reproduction Service, National Cash Register Co., 4936 Fairmont Avenue, Bethesda, Maryland 20014).
   - **Office of Education Research Reports, 1956-65, Indexes** (OE-12028), $2.00; and **Office of Education Research Reports, 1956-65, Résumés** (OE-12029), $1.75.
   - **Pacesetters in Innovation, Fiscal Year 1967** (OE-20103-67), $2.50.
   - **Pacesetters in Innovation, Fiscal Year 1968** (OE-20103-68), in preparation.
   - **Catalog of Selected Documents on the Disadvantaged; Subject Index** (OE-37002), $3.00; and **Number and Author Index** (OE-37001), 65 cents.
   - **Manpower Research: Inventory for Fiscal Years 1966 and 1967,** (OE-12036), $2.75.
   - **Manpower Research: Inventory for Fiscal Year 1968,** in preparation.

Elementary Science Telelessons Available

JUST CURIOUS, a series of thirty 15-minute lessons for the second grade student, have been developed to provide an inquiry approach to the teaching of science.

JUST CURIOUS is designed to follow a first grade course, JUST WONDERING. Besides enlarging and elaborating on the concepts introduced in the previous telelessons, JUST CURIOUS introduces techniques of measurement using the metric system and the concepts of symmetry, relative position, motion, time duration, and energy. A third telecourse, JUST INQUISITIVE, is also available in this science series.

Quadruplex video tapes or a kinescope of typical lessons from JUST CURIOUS—along with a sample copy of the accompanying teacher's guide—are available for previewing purposes upon request from Great Plains National Instructional Television Library, University of Nebraska, Lincoln, Nebraska 68508.

SIPI Publishes Workbooks

It was recently announced that workbooks for concerned citizens will be published by the Scientists' Institute for Public Information, 30 East 68th Street, New York, New York 10021. Each workbook will deal with a single major social problem which cannot be understood without some basic scientific and technical information. The new program was announced at the AAAS meeting by Dr. Margaret Mead, president of SIPI. It is expected that the workbooks will be available by Spring, 1970. SIPI expects to make the workbooks available in a format at modest cost. It is planned to follow the workbooks with more comprehensive and technical task force reports for scientists in public information work.

Scope of Coverage

The ERIC Information Analysis Center for Science and Mathematics Education is responsible for research reports and other documents related to all levels of science and mathematics—elementary, secondary, higher, and adult and continuing education. Included are those reports concerned with the clarification of science and mathematics objectives; development of curriculums and teaching materials; applications of media to science and mathematics education, with related methodological or evaluation studies; reports on the impact of such factors as interest, intelligence, values, and concept development upon learning in science and mathematics; and any reports bearing on related preservice and inservice teacher education and supervision in science and mathematics programs.

SEIAC

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ERIC--WHAT IT IS

ERIC, an acronym for Educational Resources Information Center, is a subdivision of the U. S. Office of Education's Bureau of Research. Established in 1965, ERIC is designed to bridge the gap between the researcher and practitioner in education and to put the results of educational research and development activities into the hands of those who need them--teachers, administrators, researchers--and, moreover, to do so efficiently and at a nominal cost.

Actually ERIC is not a center. Rather it is a nationwide information storage and retrieval system. At the present time ERIC consists of a headquarters in Washington, nineteen clearinghouses for collecting specialized information in the field of education, a center for processing orders and disseminating document reproductions, and a computer center for reducing duplication of effort on the part of the decentralized clearinghouses.

But why was ERIC created? Educational research and development, after many years of somewhat limited activity, is presently changing and growing at an exponential rate. Moreover, the time gap between research and its implementation has been narrowed, and the major theme in American education has become that of innovation and change. All across the country new curricula, new media, and new teaching methods are being developed.

There are many causes for the increasing efforts of educators to improve the education of boys and girls, not the least of which are the efforts of the federal government to stimulate such activities. Within the past decade the educational community has witnessed the birth of innumerable curriculum projects designed to update and improve the curriculum of various subject areas. Where once the curriculum projects concerned only college-bound secondary students, the so-called curriculum reform projects now serve the whole gamut of youngsters, urban as well as suburban, elementary as well as secondary, culturally disadvantaged as well as college-bound.

As was stated by an official of the U. S. Office of Education, this tremendous change is producing a body of reports that threatens to engulf the educational community in a sea of paper. And lost in this deluge of paper are many valuable reports, some of which may have been developed at great cost. Although in any field a certain degree of newly developed knowledge is generally expected to go unused, a great deal of frustration is caused when a researcher, having traced a report to its author, can find no copies available. It is ironic that although the educator is faced with a rising tide of paper, many important reports still elude his grasp.

But education is certainly not the first field to face the problems of high cost and duplicated research and development efforts, problems inevitably caused by a lack of coordination in information storage and retrieval. Most of the hard sciences--physics, chemistry, engineering, and the like--have faced the same problems and have developed the means to alleviate them on a national basis. Therefore, in 1966 the U. S. Office of Education, viewing the activities

of the National Science Foundation and of professional organizations in the hard sciences, recognized the need for creating another nationwide information and retrieval system, one geared to satisfying the information requirements of the educational community. It was out of this need that ERIC was born.

ERIC--THE SYSTEM

Educational Resources Information Center is in a sense a misnomer. Rather than being a center, ERIC is actually a system--a collection of bounded parts directed toward achieving a particular goal. As stated earlier, the ERIC system consists of four components: various decentralized clearinghouses responsible for gathering and disseminating information in a given area of education; Central ERIC which coordinates the activities of the various clearinghouses; a document reproduction service operated under an Office of Education contract with the National Cash Register Company, Bethesda, Maryland; and a computer and technical services branch operated under a U.S.O.E. contract with North American Rockwell of Anaheim, California.

Although each component of the ERIC system is an integral part of the whole, each performs a distinctive service in maintaining the continuous flow of information from researcher to practitioner.

INDIVIDUAL CLEARINGHOUSES

The flow of information in the ERIC system actually begins with the individual ERIC clearinghouse. Each clearinghouse, scanning and reporting on literature in a given segment of education, has the responsibility of fulfilling the information needs of a particular sector of the educational community. The clearinghouses are to a great extent decentralized. Rather than collecting educational specialists and documents under a single roof in Washington, the Office of Education, feeling that specialists and their institutions were the best judges of what documents were significant, contracted with selected institutions which were then given the responsibility of establishing the individual clearinghouses. To date, the Office of Education has sponsored nineteen such clearinghouses.

Each clearinghouse, working within its own designated area, gathers as many documents as it can each month. Some documents are obtained through voluntary contribution either by the author or by the sponsoring institution. Each clearinghouse must maintain a continuous acquisitions campaign in its effort to maintain a flow of information to those it serves.

At the ERIC Information Analysis Center for Science Education, for example, information analysts, in their effort to find valuable documents pertinent to the teaching and learning of science and mathematics, survey each month approximately twenty-five journals related to science and mathematics education. Moreover, information analysts review on a regular basis the newsletters of various organizations. Included among the newsletters are those from science and mathematics course improvement projects--BSCS, ESCP, SMSG, and others--those from projects sponsored under Title III, and those from the AAAS and other public and private organizations. Information analysts also use several other sources for identifying pertinent articles in the literature. Reviewed

regularly are the Education Index, Psychological Abstracts, Sociological Abstracts, and Dissertation Abstracts. Moreover, bibliographies in articles, research reports, and newsletters are also reviewed to identify other articles of importance.

For each reference obtained by a clearinghouse, a request is made for duplicate copies of the study. After the document has been received by the individual clearinghouse it is screened by an information analyst who determines its degree of relevance for other persons or institutions. If the document is thought to be relevant, it is then abstracted--summarized in two hundred words or less--and included, along with approximately fifty other documents, in its monthly mailing to the ERIC Facility for announcement in Research in Education.

Basically, in maintaining a continuous flow of information, the ERIC clearinghouse has five functions: (1) to gather and survey the literature pertinent in a particular field; (2) to determine the degree of relevance of the various documents surveyed; (3) to abstract those documents that are deemed to have relevance; (4) to send each month the abstracts and the corresponding documents to the ERIC Facility in Washington, D. C.; and (5) to develop and disseminate research reviews. Moreover, each clearinghouse, in an effort to promote an interest and awareness in its services, generally publishes newsletters, topical papers, bibliographies, and the like.

CENTRAL ERIC

The second component of the ERIC system is Central ERIC located in Washington, D. C. As we have indicated earlier, the ERIC system is largely decentralized; the individual clearinghouses, not Central ERIC, review and abstract the documents in the system. Rather than maintaining the flow of data, Central ERIC fulfills its primary function by coordinating the efforts of the various clearinghouses.

THE ERIC FACILITY

After documents have been analyzed and abstracted at each clearinghouse, they are shipped to the ERIC Facility in Washington, D. C. After receiving the acquisitions for the particular month, officials at the ERIC Facility feed bibliographical information into a computer and notify the clearinghouses of any duplication. In the event of duplication, which fortunately occurs rarely, the involved clearinghouses decide which one shall process the document.

EDRS

Most documents that are announced in Research in Education are shipped to the ERIC Document Reproduction Service, or EDRS as it is more commonly called. EDRS is a service provided through a U.S.O. E. contract with the National Cash Register Company in Bethesda, Maryland. At EDRS ERIC documents are stored and reproduced for anyone who submits an order.

The user of the ERIC system is offered two different types of EDRS document reproductions: microfiche and hardcopy. Microfiche, which comes from the French word for index card, are produced by a photographic process through which pages of printed text appear as rows of tiny images on a 4x6-inch sheet of film.

Microfiche has several distinct advantages over hardcopy. First, it is more economical. A 4x6 sheet of film, which contains up to 60 pages of information, sells for only 25 cents per fiche. While a 120-page document in hardcopy will cost $6.00, the same document in microfiche costs only 50 cents. Another advantage of microfiche over hardcopy is that microfiche is simply easier to store. If the entire science and mathematics education collection, which is comprised of over 7,000 documents and which covers over 100 feet of shelf space, were microfiched, the entire collection could be stored in several ordinary shoe boxes.

To read microfiche a special "microfiche reader" which enlarges microfiche images back to normal size is required. Costs of the various types of readers are variable, ranging from the simple hand reader (cost: approximately $30.00) to the reader that projects two pages at once (cost: approximately $400.00). In addition, more expensive devices called reader printers are available (cost: approximately $1,250.00). Reader printers make legible copies of the enlarged microfiche image, thus permitting the user to reproduce either an entire document or selected parts from it. For further information on microfiche readers the prospective user of microfiche may order a catalog entitled, "A Survey of Microfiche Readers and Reader-Printers Currently Manufactured in the United States." This catalog may be purchased for 50 cents from the Executive Secretary, National Microfilm Association, 250 Prince George Street, P. O. Box 386, Annapolis, Maryland 21404.

Hardcopy, which is made from the master microfiche sheet, is a reproduction of the original document. It is approximately 70 per cent the size of the original document and because it is made from a reverse photo-enlargement of the negative master microfiche, it has a positive image with black on a white background. Hardcopy, which in the ERIC system sells for five cents a page has several advantages over microfiche. It can be read anywhere without a reader and copy can be written on, if desired. However, hardcopy requires greater storage space and is more expensive than microfiche for documents of more than five pages.

ERIC--HOW TO USE IT

Research in Education

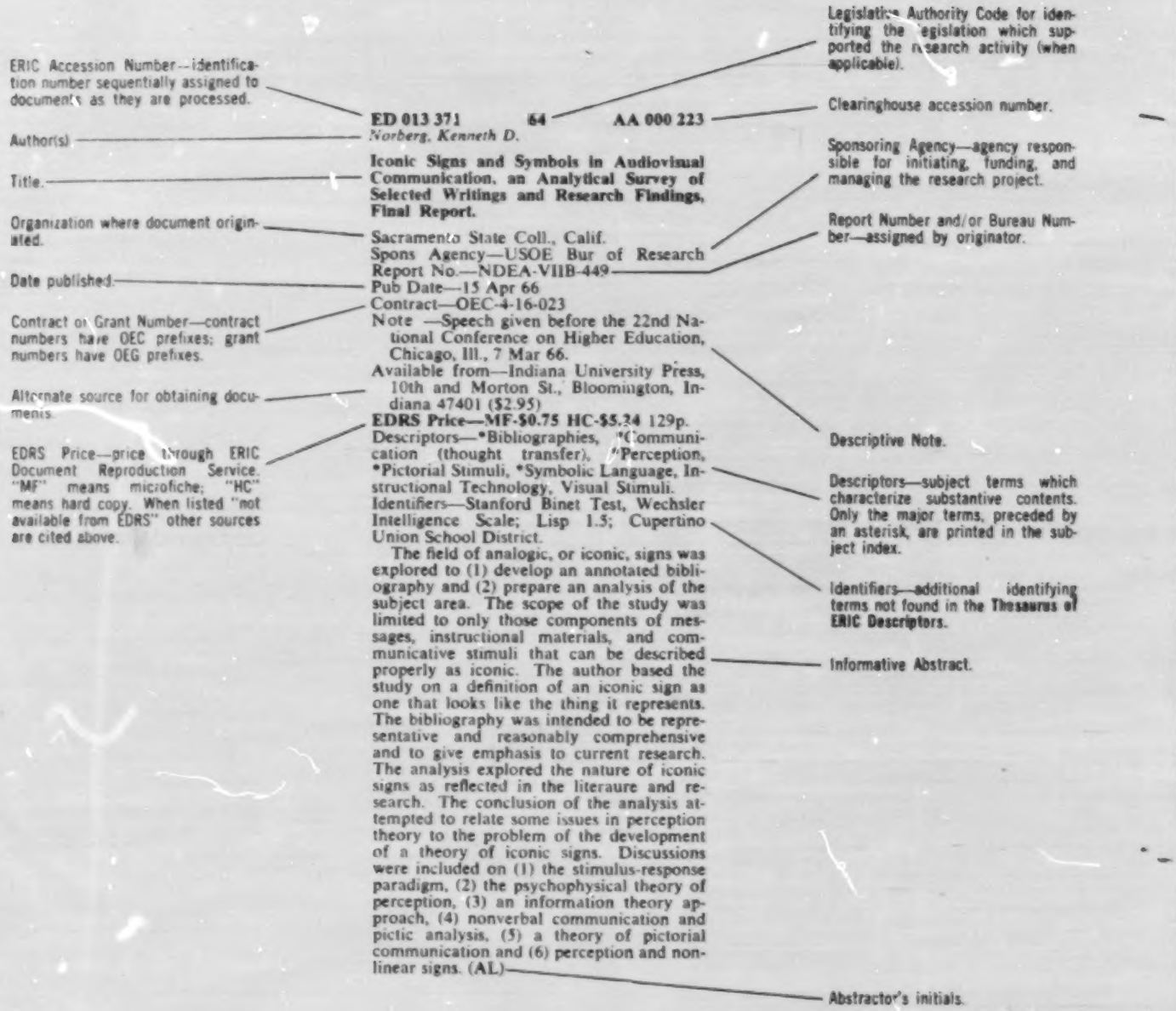
The principal means that ERIC employs in announcing recent acquisitions is a monthly journal entitled Research in Education. Available for $21.00 per year, the journal summarizes, reports on newly funded research projects supported by the Bureau of Research, and presents summaries of other significant documents relating to education.

Each issue of RIE is divided into two main sections: the document section and the project section. Published in the document section of each monthly

issue of RIE are approximately 800 abstracts submitted by various clearinghouses. In the project section are found reports of proposed or on-going research projects supported by the Office of Education. Reproductions of documents in the project section are not available from EDRS. After each section, there appear three indexes. These are used to classify input materials according to subject, author, and institutional source.

The greater portion of each issue of RIE is taken up by document and project resumés, as we have indicated previously, are brief abstracts which summarize the original document. Generally, abstracts for ERIC are fewer than 200 words in length.

The purpose of each document section entry, of which the abstract is a part, is to make the reader aware of a particular document, to help him determine its suitability to his needs, and, if he needs the document, to help him acquire a reproduction of the original from EDRS. Each entry in RIE, therefore, will not only contain an abstract but will also contain information that will help the reader gain quick access to a reproduction of the original. Accordingly, a great deal of supplementary information is contained in each entry in the document section. Look at the following example.


ERIC Accession Number—identification number sequentially assigned to documents as they are processed.
Author(s)
Title.
Organization where document originated.
Date published.
Contract or Grant Number—contract numbers have OEC prefixes; grant numbers have OEG prefixes.
Alternate source for obtaining documents.
EDRS Price—price through ERIC Document Reproduction Service. "MF" means microfiche; "HC" means hard copy. When listed "not available from EDRS" other sources are cited above.
Legislative Authority Code for identifying the legislation which supported the research activity (when applicable).
Clearinghouse accession number.
Sponsoring Agency—agency responsible for initiating, funding, and managing the research project.
Report Number and/or Bureau Number—assigned by originator.
Descriptive Note.
Descriptors—subject terms which characterize substantive contents. Only the major terms, preceded by an asterisk, are printed in the subject index.
Identifiers—additional identifying terms not found in the Thesaurus of ERIC Descriptors.
Informative Abstract.
Abstractor's initials.

ED 013 371 **64** **AA 000 223**

Norberg, Kenneth D.

Iconic Signs and Symbols in Audiovisual Communication, an Analytical Survey of Selected Writings and Research Findings, Final Report.

Sacramento State Coll., Calif.
Spons Agency—USOE Bur of Research
Report No.—NDEA-VIIB-449
Pub Date—15 Apr 66
Contract—OEC-4-16-023
Note —Speech given before the 22nd National Conference on Higher Education, Chicago, Ill., 7 Mar 66.
Available from—Indiana University Press, 10th and Morton St., Bloomington, Indiana 47401 ($2.95)
EDRS Price—MF-$0.75 HC-$5.24 129p.
Descriptors—*Bibliographies, *Communication (thought transfer), *Perception, *Pictorial Stimuli, *Symbolic Language, Instructional Technology, Visual Stimuli.
Identifiers—Stanford Binet Test, Wechsler Intelligence Scale; Lisp 1.5; Cupertino Union School District.

The field of analogic, or iconic, signs was explored to (1) develop an annotated bibliography and (2) prepare an analysis of the subject area. The scope of the study was limited to only those components of messages, instructional materials, and communicative stimuli that can be described properly as iconic. The author based the study on a definition of an iconic sign as one that looks like the thing it represents. The bibliography was intended to be representative and reasonably comprehensive and to give emphasis to current research. The analysis explored the nature of iconic signs as reflected in the literaure and research. The conclusion of the analysis attempted to relate some issues in perception theory to the problem of the development of a theory of iconic signs. Discussions were included on (1) the stimulus-response paradigm, (2) the psychophysical theory of perception, (3) an information theory approach, (4) nonverbal communication and pictic analysis, (5) a theory of pictorial communication and (6) perception and nonlinear signs. (AL)

Most of the information given in the example is fairly self-explanatory and needs no further elaboration. However, the reader should keep in mind that the cost of each document, both in hardcopy and in microfiche, appears in each citation. In this instance, cost is 75 cents for microfiche and $6.55 for hardcopy. The reader should also know that documents are ordered from EDRS through the ERIC accession number and not through the clearinghouse accession number. Orders should be sent to:

ERIC Document Reproduction Service
The National Cash Register Company
4936 Fairmont Avenue
Bethesda, Maryland, 20014

This description of how to procure materials from ERIC has been rather sketchy. A researcher in the process of determining what has been written on a certain subject would hardly browse through RIE, haphazardly selecting those reading materials which strike his fancy. Rather, he would conduct a thorough systematic search, and in so doing, employ two valuable ERIC reference tools--RIE and the Thesaurus of ERIC Descriptors. Since Research in Education and many of the other ERIC publications offer several approaches to finding information, the researcher may use the author index to find out what a particular author has written, he may use the institution index to find out what a particular institution has published, or he may use the accession number when only the clearinghouse number or the ERIC accession number is available.

Using the alphabetical ERIC subject index is a relatively simple matter, much like using the index of most textbooks. However, the researcher in using this type of index may encounter difficulties which stem from several different causes. The researcher may not have narrowed his topic sufficiently, he may not have known under which subject heading to look, or he may not have known or selected the proper search terms. Since selecting appropriate retrieval terms is crucial to a successful search, ERIC, in an effort to help the researcher avoid these difficulties, has prepared a Thesaurus of educational terms.

The Thesaurus of ERIC Descriptors published by Central ERIC is a collection of the cross-reference terms used when storing and searching for documents. These descriptors, as they are called, are also the asterisked terms which appear above each RIE abstract.

The Thesaurus is divided into two sections. The first section is a listing of descriptors. In this section descriptors are listed under a main entry, and the relationship of those descriptors under a major heading is shown. Descriptors may be thus designated as narrower terms (NT), broader terms (BT), or related terms (RT). The following is an example of a citation in the descriptor listing:

COMMUNICATION SKILLS
BT SKILLS
RT COMMUNICATION (THOUGHT TRANSFER)
DEAF INTERPRETING
FINGER SPELLING
RECEPTIVE LANGUAGE
TEACHING SKILLS
VERBAL ABILITY

The second section, the Rotated Descriptor Display, appears in the back of the Thesaurus. The display gives an alphabetical rotation of all terms which make up multiword descriptors. Thus "communication skills" would appear amid the following descriptors:

AGRICULTURAL SKILLS
ALPHABETIZING SKILLS
BASIC SKILLS
BUSINESS SKILLS
COMMUNICATION SKILLS
DECISION MAKING SKILLS

In locating what has been written on a certain subject, the researcher, after narrowing his subject and selecting key terms, would probably refer to the Thesaurus to find the necessary descriptors. After learning the proper retrieval terms, the researcher would check the subject index of RIE which would direct him to the appropriate abstracts. However, rather than checking each monthly issue of RIE, the researcher in an effort to save time would probably refer to the annual or semiannual indexes to RIE. After locating and reading the abstracts, the researcher could then determine which text reproductions he desires, list the appropriate ERIC accession numbers, and with a check for the proper amount send his order to EDRS.

CURRENT INDEX TO JOURNALS IN EDUCATION

Current Index to Journals in Education (CIJE) is a new monthly index that currently covers over 300 periodicals and which will be covering many more journals within a few months. It is published by CCM Information Corporation and was developed in cooperation with the Educational Resources Information Center (ERIC) of the U. S. Office of Education. CIJE is a companion publication to Research in Education.

Among the features of the publication are a main entry section, subject index, author index, and index to source journals.

THE CLEARINGHOUSE FOR SCIENCE EDUCATION

The clearinghouse for science education officially known as the Science Educational Information Analysis Center, was established June 15, 195 , and is sponsored by The Ohio State University. Located in a facility near the campus of The Ohio State University, the Center has access to all the major resources provided by the university and by local agencies. Units of The Ohio State University which provide assistance to the Center include the Center for Science and Mathematics Education, The Ohio State University Library System, and the Numerical Computation Center. Agencies which have provided valuable assistance to the Center include the Battelle Memorial Institute and Chemical Abstracts.

The Center at present is staffed by a director, two associate directors, six research assistants, and six secretaries. The current facilities occupy 3,450 square feet. This space is divided into ten offices, two machine rooms, a document library, a conference room, a storage area, and a central office area.

The primary function of the Center is the retrieval and dissemination of important information related to science and mathematics education. Materials, which are acquired, processed and filed, include research documents, speeches, teacher guides, program outlines, textbooks, bibliographies, conference proceedings, and pertinent journal articles. These data are obtained from universities, state departments of education, school districts, individual researchers, and organizations related to science and mathematics education. A major source of materials results from cooperative arrangements with 20 colleges and universities, the National Science Teachers Association, and the National Association for Research in Science Teaching.

After a document has been acquired by the Center, it is assigned a clearinghouse acquisition number and is evaluated for quality and importance to the field of science or mathematics education. Based on predetermined selection criteria, documents are selected or rejected for local input and for input to the ERIC system. The next step in processing a document involves recording supplementary bibliographic information: author's name, sponsoring institution, number of pages, and the like. The research analyst then lists the important retrieval terms and summarizes the document; the ERIC report resume is then typed, proofread, and sent along with a copy of the corresponding document to the ERIC Facility at North American Rockwell. A sample resume appears on the following page.

OE FORM 6000, 2/68

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF EDUCATION

ERIC REPORT RESUME

ERIC ACC. NO.				IS DOCUMENT COPYRIGHTED?	YES ☐ NO ☒
CH ACC. NO.	P.A.	PUBL. DATE	ISSUE	ERIC REPRODUCTION RELEASE?	YES ☐ NO ☒
SE 006 305		69		LEVEL OF AVAILABILITY	I ☒ II ☐ III ☐

AUTHOR
Carey, Russell L.; Steffe, Leslie P.

TITLE
An Analysis of the Effects of Selected Experiences on the Ability of Preschool Children to Use Conservation of Length and Conservation of Length Relations

SOURCE CODE	INSTITUTION (SOURCE)
IEE29100	Georgia University, Athens
SP. AG. CODE	SPONSORING AGENCY

EDRS PRICE	CONTRACT NO.	GRANT NO.
0.25;0.75		

REPORT NO.	BUREAU NO.

AVAILABILITY

JOURNAL CITATION

DESCRIPTIVE NOTE
13p.; Paper presented at the annual meeting of the National Association for Research in Science Teaching, Pasadena, California, February 1969

DESCRIPTORS
*Curriculum Development; *Elementary School Mathematics; *Instruction; *Learning; *Measurement

IDENTIFIERS

ABSTRACT
This study was concerned with the effects of selected experiences on the ability of preschool children to use conservation of length and conservation of length relations. The experiences involved the equivalence relation "the same length as" and the two order relations "shorter than" and "longer than." The subjects were 51 four and five year old children in the Suder Elementary School, Jonesboro, Georgia. Students' verbal maturity, intelligence, and social class ranges were measured by the Peabody Picture Vocabulary Test, Stanford Binet Intelligence Scale, Form L-M, and the Hollingshead Two Factor Index of Social Position, respectively. All children received instruction in establishing length relations between two curves, conserving length relations, and conserving length. The conclusions drawn from an 18 item conservation of length relations test support Piaget's Theory that experience is necessary, but not sufficient for the development of logical thought. The data suggest that the ability to use the reflexive property is different from and precedes the ability to use the non-reflexive property. Finally, there appears to be little, if any, relation between the student variables, Verbal Maturity, I.Q., Age, and Social Class, and scores earned by four and five year old children on conservation of length items involving the reflexive or non-reflexive property. (RP)

The Center has also fulfilled many requests for information concerning research in science and mathematics education. Each inquiry is conducted by a trained information analyst and is given his personal attention. If one wishes to know what work is being conducted in a particular area of science or mathematics education, a search can often be made and a bibliographic listing of relevant research will be sent at no cost to the inquirer.

While the Center, like many other clearinghouses, will make individual searches, users of the ERIC system are urged to consult RIE and the ERIC Thesaurus before making inquiries of any individual ERIC Clearinghouse. Since an ERIC clearinghouse can provide only information within its particular domain, the amount of information it can provide is often limited and may present the researcher with a distorted picture of the state of research in any given area. It should be pointed out that many of the clearinghouses, this Center among them, have published numerous bibliographies on specialized subjects. These bibliographies in many instances may preclude the need for individual searches.

The Science Education Information Analysis Center, in addition to submitting abstracts for publication in RIE, sponsors its own series of publications. Among them are the SEIAC bibliographies, the SEIAC newsletters, and the SEIAC topical papers. The bibliographies deal with specialized topics relating to science and mathematics education. Each issue of the newsletter, which is published four times per year, deals with a particular aspect of science and mathematics education. The staff of the ERIC Center on Science Education has prepared and is in the process of preparing various analyses of research in different areas of science and mathematics education. Several of these topical papers have appeared in various periodicals. Others are being issued as occasional papers by this Center. The SEIAC Newsletter will announce when new publications become available.

SEIAC--AND YOU

The success of the ERIC Clearinghouse on Science Education, for that matter of any ERIC clearinghouse, depends upon the cooperation of the educational community it serves. Since it is virtually impossible for the staff of SEIAC to gain access to every new important document in science education, and since the effective dissemination of information is dependent upon the acquisition of current, significant reports, it is imperative that science educators add SEIAC to their distribution lists, or otherwise ensure that SEIAC receives two copies of future reports. The Center seeks not only research reports but also conference papers, curriculum guides, preliminary project reports--in fact, any document that will have value for teachers, administrators, or researchers specializing in science and mathematics education.

By submitting a document to the ERIC system, an author may gain a greater national audience; but more significantly, however, by granting his work nationwide dissemination through the ERIC system, he can ensure that his research will make a more valuable contribution to education.

It is a truism that output is dependent upon input. Therefore, the Clearinghouse on Science Education actively seeks the patronage of all science and mathematics educators--not only in demand but in supply.

SMAC

ERIC

CENTER COMMENTS

The ERIC Information Analysis Center recently installed a computer search program that will assist in searching magnetic tapes containing citations and abstracts of documents announced through the ERIC system. At the current time all ERIC tapes available from Leasco Data are available for searches. We have also been developing procedures to place our total local collection on tape. When this program is completed in the Fall, 1970 over 12,000 documents in the fields of science and mathematics education will be able to be searched with the assistance of this computer program. The search program permits the search of individual descriptors such as secondary school science or secondary school mathematics or the search of combinations of descriptors. A search of secondary school science or secondary school mathematics would yield a large number of citations and abstracts of documents.

Narrower searches can also be made by combining terms. For example, a search to locate evaluation instruments for specific use in secondary school biology classes could be obtained by combining secondary school science, biology, and evaluation. This list of documents could then be reviewed to select those documents of interest to you. A person interested in instructional materials for slow learners in mathematics at the elementary school level could obtain a bibliography by combining the terms instructional materials, elementary school mathematics, and slow learners.

We are currently planning to prepare a number of bibliographies in the areas of science and mathematics education by use of the search program. Procedures for making these bibliographies available at moderate cost are being reviewed with the National Science Teachers Association and the National Council of Teachers of Mathematics and will be announced when completed.

We would appreciate your comments regarding bibliographies which you would like to have available. Please send your suggestions to:

Dr. Robert W. Howe, Director
ERIC Information Analysis Center
for Science and Mathematics Education
1460 West Lane Avenue
Columbus, Ohio 43210.

EDRS Foreign Export Charges Are Reduced

Export charges on orders from Canada and Mexico have been eliminated completely on individual orders under $50.00, and orders over $50.00 will have a 15% service charge as of February 21, 1970 through February 20, 1971. Export charges have been reduced from 25% to 15% on all foreign orders for collections and standing orders for microfiche announced in **Research in Education.**

TWO NEW CLEARINGHOUSES ADDED TO ERIC SYSTEM

Two new clearinghouses, one on Social Science Education and the other on Tests, Measurement, and Evaluation, were added to the **ERIC** system May 1, 1970.

Dr. Irving Morrissett is acting director of the **ERIC** Clearinghouse on Social Science Education. This clearinghouse is operated by the Center for Education in the Social Sciences of the University of Colorado (CESSUC) in collaboration with the Social Science Education Consortium, Inc. (SSEC). Clearinghouse address:

ERIC Clearinghouse for Social Science Education
Social Sciences Building
970 Aurora Avenue
Boulder, Colorado 80302.
Phone: Area Code 303 443-2211 Ext. 8155.

Dr. Henry Dyer is director and principal investigator of the **ERIC** Clearinghouse on Tests, Measurement, and Evaluation. This clearinghouse was awarded to the Educational Testing Service at Princeton, New Jersey. Clearinghouse address:

ERIC Clearinghouse on Tests, Measurement,
and Evaluation
Educational Testing Service
Princeton, New Jersey 08540.
Phone: Area Code 609 921-9000.

OID Changed to NCEC

ERIC, a branch of the former Office of Information Dissemination (OID), will answer to a different name. OID was recently renamed the National Center for Educational Communication (NCEC).

NCEC will be responsible not only for the dissemination of information but also for the development and maintenance of numerous information exchange programs at the state and local level.

A Division of Information Resources, a Division of Practice Improvement, and a Copyright Administration Staff have also been established as sub-elements of NCEC.

The Division of Information Resources includes three organizational units: **ERIC**, the Educational Materials Center, and a new unit, the Educational Reference Center. Harvey Marron will be Acting Director of the new division in addition to his present duties as Chief of **ERIC**. Thomas D. Clemens will be Acting Director of the Division of Practice Improvement which will focus on research utilization and information analysis programs to relate research and development to the practical needs of educators and promote the adoption of tested educational innovation. Dr. Morton W. Bachrach will head the Copyright Administration Staff which will report to NCEC Acting Assistant Commissioner Dr. Lee G. Burchinal.

SE 017 935

Résumés Are Omitted From April RIE

The eleven résumés (ED 034 075—ED 034 086) omitted from the April issue of **Research in Education** are on an insert page titled **Special Notice to Users of Research in Education: Correction in the May RIE.**

Résumés were omitted by the computer developing the linotron magnetic tape from the Document Résumé Section of the April **RIE**. However, the index entries (Subject, Author, Institution, and Cross Reference) are located in the April issue.

Educational Reference Center Has Access to ERIC Resumes

The newly formed Educational Reference Center features an on-line terminal for searching the computer file of **ERIC** résumés.

In addition to this asset, the Center provides a "one-stop" reference and information retrieval service for OE professional staff. The new unit, located on the first floor of the main Office of Education building (400 Maryland Avenue), serves as a model, demonstration site, and training center for staff from state and local districts, and other institutions if they are interested.

For information about visiting the Center, write Chief, Educational Reference Center, National Center for Educational Communication, Office of Education, Washington, D. C. 20202 or call (202) 963-5061.

USOE Copyright Guidelines Revised

Effective for the first time June 8, 1970, the U. S. Office of Education may share with its grantees and contractors copyright royalties received for published educational materials.

Under the new guidelines royalty sharing has been authorized for commercial publications under copyright as an incentive to any non-profit grantee or contractor institution which developed the materials. Each co-sponsor—any person, organization, or government agency which contributed materially to the project for developing the educational materials—is entitled to share in the royalties. Grantees or contractors may elect to retain either 50 percent of the net royalty or the percentage which corresponds with their financial contribution to the project. They are also now permitted to decide whether or not they want to have materials published under copyright.

The new policy continues the requirement that publishers must be selected competitively by the grantee or contractor when authorization to secure copyright protection has been granted. Such authorization awarded on an exclusive basis is normally limited to five years. As a blanket extension to its policy OE also places no restrictions on the publication of educational articles in scholarly and professional journals or in other similar periodicals.

For additional information or further guidance, clearinghouses can contact Dr. Morton W. Bachrach, Copyright Administration Staff, National Center for Educational Communication, 400 Maryland Avenue, S.W., Washington, D. C. 20202—(202) 962-0741.

SMAC ERIC PRODUCTS AVAILABLE INCLUSIVE TO MAY 1970

SMAC General Bibliography Series

The Science and Mathematics Education Information Analysis Center periodically prepares a set of ten bibliographies. Each one summarizes the documents processed within one or more of the primary subject categories since the last set of bibliographies was prepared. Therefore, **Bibliography 20** is an update of **Bibliography 10**. Three sets of bibliographies are currently available; a fourth set is being prepared for release.

Instructional Procedures (1)
ED 015 877 MF-0.50 HC-3.30

Teacher Education (2)
ED 015 879 MF-0.25 HC-2.35

Equipment and Materials (3)
ED 015 880 MF-0.50 HC-3.15

Curriculum (4)
ED 017 473 MF-0.50 HC-6.10

Achievement (5)
ED 015 878 MF-0.25 HC-1.80

Teacher Resource Materials (6)
ED 021 772 MF-0.50 HC-4.65

Science and Society
History of Science Education
Science History, General Studies and Surveys (7)
ED 021 771 MF-0.25 HC-1.50

Legislative Acts and Reports
Administration and Supervision
Science Facilities (8)
ED 021 766 MF-0.25 HC-0.75

Evaluation and Educational Objectives
Learning Theories and Processes
Research Methodology (9)
ED 021 774 MF-0.25 HC-1.75

Teacher Characteristics
Student Characteristics (10)
ED 021 773 MF-0.25 HC-0.95

Instructional Procedures (11)
ED 026 277 MF-0.50 HC-3.40

Teacher Education (12)
ED 026 278 MF-0.25 HC-1.80

Equipment and Materials (13)
ED 026 279 MF-0.50 HC-4.05

Curriculum (14)
ED 026 280 MF-0.50 HC-6.00

Achievement (15)
ED 026 281 MF-0.25 HC-1.45

Teacher Resource Materials (16)
ED 026 282 MF-0.50 HC-4.75

Science and Society
History of Science Education
Science History, General Studies and Surveys (17)
ED 026 283 MF-0.25 HC-1.70

Legislative Acts and Reports
Administration and Supervision
Science Facilities (18)
ED 026 284 MF-0.25 HC-0.90

Evaluation and Educational Objectives
Learning Theories and Processes
Research Methodology (19)
ED 026 285 MF-0.25 HC-2.55

Teacher Characteristics
Student Characteristics (20)
ED 026 286 MF-0.25 HC-1.35

Instructional Procedures (21)
ED 030 772 MF-0.50 HC-3.00

Teacher Education (22)
ED 032 441 MF-0.25 HC-1.90

Equipment and Materials (23)
ED 032 442 MF-0.50 HC-4.50

Curriculum (24)
ED 032 443 MF-0.50 HC-6.35

Achievement (25)
ED 032 444 MF-0.25 HC-1.40

Science and Society
History of Science Education
Science History, General Studies and Surveys (27)
ED 032 445 MF-0.25 HC-1.45

Legislative Acts and Reports
Administration and Supervision
Science Facilities (28)
ED 032 446 MF-0.25 HC-0.95

Evaluation and Educational Objectives
Learning Theories and Processes
Research Methodology (29)
ED 030 781 MF-0.50 HC-3.50

Teacher Characteristics
Student Characteristics (30)
ED 030 782 MF-0.25 HC-1.15

Articles

Articles, published and to be published in periodicals, analyze research in various areas of science and mathematics education and indicate implications of research for teaching of these respective subjects. The articles listed are available through EDRS. (Other articles have been published but are not yet available through EDRS.)

An Analysis of Research
on Instructional Procedures
in Secondary School Science,
Part I—Outcomes of Instruction
Robert W. Howe & Gregor Ramsey
ED 026 287 MF-0.25 HC-0.50

An Analysis of Research
on Instructional Procedures
in Secondary School Science,
Part II—Instructional Procedures
Gregor A. Ramsey & Robert W. Howe
ED 027 233 MF-0.25 HC-0.65

An Analysis of Research Related
to Instructional Procedures in
Elementary School Science
Gregor A. Ramsey & Robert W. Howe
ED 027 232 MF-0.25 HC-0.70

An Analysis of Research Related
to the Education of Secondary
School Teachers
Patricia E. Blosser & Robert W. Howe
ED 025 444 MF-0.25 HC-0.55

Research Reviews

Research Reviews analyze and synthesize research related to science and mathematics education over a period of several years. Reviews for 1963-64 and 1965-67 have been completed. As these reviews are available through EDRS they will be announced in the **SMAC Newsletter.** (Reviews for 1968-69 are currently being prepared.)

Science Education Information Reports
Research Review Series—Science Paper 1
A Summary of Research in Science Education
For the Years 1965-67, Secondary Level
Paul Westmeyer And Others
ED 034 913 MF-0.25 HC-1.90

Research Review Series—Science Paper 2
A Summary of Research in Science Education
For the Years of 1965-67, Elementary
School Level
Richard Haney And Others
ED 038 554 MF-0.25 HC-1.70

Research Review Series—Science Paper 4
A Review of the Research and Literature
on the Chemical Education Materials
Study Project
Gregor A. Ramsey
ED 037 592 MF-0.25 HC-1.70

Occasional Papers

Occasional Papers, issued periodically, indicate implications of research for science and mathematics teaching. These are being developed in response to requests for information. Two papers have been developed related to inservice education.

Science Education Information Reports
Occasional Paper Series—Science Paper 1
Inservice Education For Teachers of Secondary
School Science
Patricia E. Blosser
ED 034 912 MF-0.25 HC-2.75

Science Education Information Reports
Occasional Paper Series—Science Paper 2
Inservice Education For Teachers of Elementary
School Science
Patricia E. Blosser
ED 036 680 MF-0.50 HC-3.00

Special Bibliographies

Special Bibliographies are also prepared to provide information related to requests received at this Center.

Science and Mathematics for Young Children
An Annotated Bibliography
(Special Bibliography 1)
Francis Case Theiss
January, 1964—June, 1969
ED 033 259 MF-0.25 HC-1.75

Research Reporting Sections

The SMAC staff compiles abstracts of research papers presented at various educational conferences and coordinates these abstracts into Research Reporting Sections of each meeting. Abstracts of the papers presented at the 1969 and 1970 meetings of the National Association for Research in Science Teaching (NARST) are available from EDRS. Abstracts of papers presented at the 1970 NARST meeting are also available from EDRS.

National Association for Research in Science Teaching, 42nd Annual Meeting, February, 1969.
New Approaches to Science Education Research, Abstracts of Presented Papers
ED 027 227 MF-0.50 HC-4.65

National Association for Research in Science Teaching, 43rd Annual Meeting, March 5-8, 1970.
Abstracts of Presented Papers
Minneapolis, Minnesota
ED 034 914 MF-1.00 HC-11.85

National Council of Teachers of Mathematics, 48th Annual Meeting, April 1-4, 1970.
Golden Jubilee Year, Washington, D.C.
ED 036 670 MF-0.50 HC-3.55

Ordering Information

Documents can be ordered from **ERIC** Document Reproduction Service (EDRS), National Cash Register Company, 4936 Fairmont Avenue, Bethesda, Maryland 20014. Be sure to include the document number (ED number) when ordering. MF indicates the microfiche price and HC indicates the hardcopy price. Be certain to indicate the form of the document (MF or HC) you want.

ERIC MASTER FILES ON MAGNETIC TAPES ARE NOW AVAILABLE

ERICTAPES—containing Report Résumé Files, Journal Article Résumé Files, and a Thesaurus File—are now available for public sale from LEASCO Systems & Research Corporation. Under a special authorization by the Office of Education, LEASCO has been granted the exclusive right to sell magnetic tape copies of Educational Resources Information Center's (**ERIC's**) master files effective March 16, 1970.

ERIC files represent virtually complete coverage of current significant developments in educational research. Report literature is covered from 1966, and journal literature from January 1969. These files have been assembled by a network of cooperating agencies, including: 20 subject-specialized clearinghouses operated by universities and professional organizations; the Office of Education, DHEW; and several private contractors.

Requirement for access to the **ERIC** data base in machine-readable form exists both within the **ERIC** dissemination network and in other areas of the educational community. In order to meet this requirement in the most timely, equitable, and economic manner, the Office of Education has determined that the entire user community will be best served by permitting open sale of the files in the form of magnetic tapes. On the strength of LEASCO's experience in large scale dissemination of magnetic tapes in a wide variety of formats and their familiarity with the **ERIC** system and program as operator of the **ERIC** Processing and Reference Facility, they were selected to perform this task.

Files available are:

REPORT RÉSUMÉ FILES

These files consist principally of résumés of research reports filed by contractors and grantees on the results of funded educational research. All ED numbered documents announced in **Research in Education** and other **ERIC** publications, will be on file. Each résumé includes full descriptive cataloging, indexing, and an abstract. As of the end of 1969, there were 31,623 report résumés on file, and the number is expected to grow at a rate of approximately 900 per month. Quarterly updates will be available. Most of these reports are available from **ERIC** Document Reproduction Service (EDRS), 4936 Fairmont Avenue, Bethesda, Maryland 20014, on microfiche or in hardcopy form.

JOURNAL ARTICLE RÉSUMÉ FILES

These files consist of résumés of journal articles on educational research selected from over 500 education and education-related journals. All EJ numbered accessions announced in **Current Index of Journals in Education** will be on file. These résumés are in the same format as the **ERIC** report résumés, except that the abstract is replaced by a 30 to 50 word annotation when the title does not clearly indicate the subject matter of the article. As of the end of 1969, there were 11,702 journal article résumés on file, and the number is expected to grow at a rate of approximately 1500 per month. Quarterly updates will be available.

THESAURUS FILE

This file consists of the complete **Thesaurus of ERIC Descriptors** from which subject indexing terms are selected for both report résumés and journals article résumés. In addition to Main (postable) Terms, Use References and Scope Notes, it includes both hierarchical (Broader Term, Narrower Term) and Related Term cross-references. As of the end of 1969, there were 6878 terms (4650 Main Terms and 2228 Use References) on file, and the number is expected to grow at a rate of approximately 30 per month. Quarterly updates will be available.

In addition to the tape version, a hard-bound printed version is available from CCM Information Corporation, 909 Third Avenue, New York, New York 10022. Price: $7.95 per copy.

Files are available on either 9-track tapes (1600 or 800 BPI) or 7-track tapes (800 or 556 BPI), in the form of IBM System/360 Operating System variable length records. Service will be provided under one of two options: (1) LEASCO will provide files on high-quality, unused tapes with reduplication guarantee and mail tapes within 7 working days of receipt of the order (Price—$80.00 per tape reel), (2) LEASCO will duplicate files on customer supplied, certified previously unused tapes with limited reduplication guarantee and mail tapes within 14 working days of receipt of the order or a sufficient number of usable tape reels, whichever is later (Price—$50.00 per tape reel).

To place orders or if you have further questions write to:

LEASCO System & Research Corporation
ATTN: ERICTAPES
4833 Rugby Avenue
Bethesda, Maryland 20014
PHONE: Area Code 301 656-9500,
Extension 364.

Drug Discussions Televised

DRUGS USE AND ABUSE, a televised "trip" discussing the national "speed" problem, has been created and produced by the Massachusetts State Department of Education's 21 Inch Classroom and WGBH-TV in Boston. Great Plains National Instructional Television Library is national distributor of the series.

The four, 30-minute programs are arranged as follows: Programs one and four are discussions between students, teachers, a parent, and doctors about the drug problem and alternatives to taking drugs. In programs two and three, information is presented by doctors who have worked with drug users. Young people who have used drugs also talk with these doctors about some of their experiences, feelings, and attitudes.

A one-hour teacher orientation program is also included in DRUGS USE AND ABUSE. The program is to familiarize the instructor with the style and content of the student programs and to permit him to listen to experiences of some teachers who have tested the series in their classroom.

Dean Yarbrough, Jr., an urban junior high school teacher, hosts the teacher's program and also participates in discussion-programs one and four. He is joined by Eric Esselstyn, a suburban high school teacher; Harold Amrhein, a junior high school teacher; Mrs. June Johnson, a teacher at a regional high school; Miss Inez Russell, an urban health supervisor; Dr. Graham Blaine, Jr., Harvard University Health Center associate; Pat Bagley, suburban high school senior; and Eddy and Herbie Williams, urban junior high school students.

A sample preview (one-half hour from the teacher's program) is available on either quadruplex video tape or kinescope. A sample copy of the teacher's guide is available from Great Plains National Instructional Television Library, University of Nebraska, Lincoln, Nebraska 68508.

SIPI Workbooks Published

Eight environmental workbooks are now available from the Scientists' Institute for Public Information, 30 East 68th Street, New York, New York 10021.

Workbooks available are: **Air Pollution, Environmental Cost of Electric Power, Hunger, Water Pollution, Environmental Education: 1970, Environmental Effects of Weapons Technology, Pesticides, Nuclear Explosives in Peacetime.**

Another workbook, **Law and the Environment,** will be added to the series this summer. The series may be further expanded later.

Single copies are $1.00; a set of eight different titles, $5.00; orders of 10-100, 75c each; orders of 100 or more, 50c each; and orders of 1,000 or more (special offer to campuses only), 35c each.

Reading Resources Network Established

ERIC Reading Resource Centers opened this spring at 36 colleges and universities with graduate reading programs. Each institution has agreed to provide space and staff for a one-stop information center in the **ERIC** Reading Resources Network. The RRN is part of **ERIC's** continuing effort to disseminate research information more effectively at the state and local levels.

Essentially, the major task of the network will be to initiate and maintain a flow of information in the field. The centers will be strategically located throughout the U. S. to serve populations in specific geographic regions and will function under the leadership and in support of ERIC/CRIER as an information producing and disseminating center. Each center will maintain a reference collection of ERIC/CRIER and International Reading Association resources and **ERIC** microfiche. It will identify and input significant material in reading education to ERIC/CRIER and develop visibility in its local region so that its information resources will become known and used.

Further details of plans for the network can be found in the "Prospectus for Developing a Reading Resources Network Center" announced in ED 032 451, AA 000 415, Mabel Culmer, November 1969—MF: $0.25; HC: $2.10. A news item on the RRN also appeared in the Jan/Feb 1970 issue of **American Education.**

Environmental Sciences Curricula Report Available

University Curricula in the Marine Sciences and Related Fields, a compilation of institutions offering courses and degrees in marine sciences during the 1969-70 and 1970-71 academic year, has been published by the National Council of Marine Resources and Engineering Development.

The report, intended to assist prospective students, research workers, and instructors, identifies career opportunities offered by various universities in the following categories: Marine Science, Ocean Engineering, Maritime Officers, Fisheries, and Marine Technicians.

The publication is available at $2.00 per copy from—

Superintendent of Documents
U. S. Government Printing Office
Washington, D. C. 20402.

SMAC

ERIC

CENTER COMMENTS

During the past several months we have been reviewing various activities and products of **ERIC/SMAC**. With the addition of mathematics education and environmental education to the scope of the Center, we have decided to issue separate newsletters for science education, mathematics education, and environmental education.

Newsletters related to environmental education are being released eight times a year on a monthly basis October through June. These newsletters contain information regarding instructional materials, educational programs, research grants, current events in environmental education, bibliographies of resource material, and information regarding federal programs. A limited number of back issues are available on request.

Separate newsletters related to science education and to mathematics education will be released four times a year beginning in the Spring of 1971. Separate issues for each field will provide space for short research reviews and special bibliographies. These publications will replace the current combined newsletter which has also been released four times a year.

New mailing lists are currently being developed for these three publications. A form is enclosed for you to indicate which newsletter(s) you would like to receive. Please return the form to **ERIC/SMAC** with the information requested. Newsletters released after April 1, 1971 will use the new mailing lists.

Robert W. Howe
Director

Changes Made in ERIC System

The **ERIC** Clearinghouse on Educational Administration, at the University of Oregon, 320 Hendricks Hall, Eugene, Oregon 97403, has been changed to the **ERIC** Clearinghouse on Educational Management. Educational Management is taking over the activities of the recently terminated **ERIC** Clearinghouse on Educational Facilities formerly at the University of Wisconsin.

The **ERIC** Clearinghouse on Library and Information Sciences has a change of address:

American Society for Information Science
1140 Connecticut Avenue, N.W.
Suite 804
Washington, D.C. 20036.

Descriptor Data Available

Limited quantities are available of a computer printout containing **ERIC** Descriptor Usage and Statistical Data for the entire **ERIC** magnetic tape file up to July, 1970's **Research in Education.**

Data is presented in two sections:

(1) ERIC Descriptor Usage Report
An alphabetic array of all **ERIC** Descriptors together with the accession numbers to which they have been assigned.

(2) ERIC Descriptor Usage Statistical Report
An alphabetic array of all **ERIC** Descriptors together with statistical data showing the number of times each Descriptor has been used within the various accession series, the number of times used as a major (published) or minor (machine record only) Descriptor, and the total number of times used in all series. Section 2 represents a tabulation of the data displayed in Section 1.

Until the supply is depleted, copies will be available for $30 each. Orders should be sent to:

LEASCO Systems and Research Corporation
ATTN: ERICTAPES
4833 Rugby Avenue
Bethesda, Maryland 20014

Physics Film Repository Open for Orders

The Commission on College Physics has developed an experimental project called Physics Film Repository "to find out whether other physicists will use the 'homemade' films of their colleagues."

Most films are expected to be single concept cartridge length 8mm types. However, films may be obtained in any 8mm or 16mm format. Film prices range from $10.00 to $20.00.

Although there will be no provision for individual previewing, the author's film notes will be provided free upon request.

Films available include: "Lenz Law I," "Lenz Law II," "Group Velocity," "Large Inductance: Current Buildup," "Large Inductance: Free Oscillations," "Hysteresis," "The Ramsauer Effect," "Fourier Series," "Instantaneous Speed," "Image Methods in Electrostatics," and "A Simulated Foucault Pendulum."

For further film information, write:

Commission on College Physics
Department of Physics and Astronomy
University of Maryland
4321 Hartwick Road
College Park, Maryland 20740

SE 017 935

Science and Engineering Awards Program Introduced

"Tomorrow's Scientists and Engineers" is a new awards program open to any U.S. public, private, parochial, or overseas school student in grades 7 through 12.

The program is jointly administered by the National Science Teachers Association, the Engineers' Council for Professional Development, and Scholastic Magazines, Inc. Humble Oil & Refining Company sponsors the awards program. The new program is approved by The National Association of Secondary School Principals for 1970-71.

To participate, students should submit a written report (1,500 to 5,000 words) based on their original work in any branch of science or engineering. Reports must be postmarked no later than March 1, 1971. Winners will be announced April 15, 1971.

The program is divided into twelve geographic regions and into three groups: Grades 7-8, 9-10, and 11-12. Of the 910 awards, ten $6,000 scholarships will go to the national winners selected from the regional winners in Grade 12. In addition to educational assistance awards and honorable mention medallions, all winning entries will be considered for publication in **Science World** magazine.

Teachers may obtain entry materials and a rules booklet from:

National Science Teachers Association—TSE
1201 Sixteenth Street, N.W.
Washington, D.C. 20036.

Video Tapes Available For Teacher Education

The Video Tape Project, located at the Carleton College in Northfield, Minnesota, prepares tapes for use in preservice and in-service teacher education courses. Tapes capture the natural (unrehearsed and spontaneous) classroom activities of elementary and secondary classrooms.

The project was initiated June 1, 1964 under a grant from the Charles F. Kettering Foundation to the Associated Colleges of the Midwest. Additional support was received in 1968 with a grant from the National Science Foundation (NSF) for taping materials related to NSF supported projects. After a second grant from NSF, the project was transferred to Carleton College.

Tapes are available for distribution in the fields of social studies, mathematics, modern languages, science, general methods, and foundations of science. Three editing formats are available: (1) tapes which are essentially unedited and show a complete lesson; (2) tapes which condense several days' lessons into one tape but retain the continuity of the lesson, and (3) "topical" tapes showing portions of lessons from several different teachers and/or classes and focusing on one particular aspect of teaching methodology.

Printed supplementary materials contain suggestions for using tapes. A video guide is provided to encourage the use of tapes as "teach along" devices.

Taping has been and is being done in the classrooms of teachers using materials from the following newer elementary and secondary science curriculum projects: AAAS Commission on Science Education, Biological Sciences Curriculum Study, Chemical Education Material Study, Elementary Science Study, Introductory Physical Science, Minnesota Mathematics and Science Teaching Project, Physical Science Study Committee Physics Course, and Science Curriculum Improvement Study.

A $20.00 dubbing charge is made for each teacher education tape. A catalog of tapes is available from project headquarters.

Referral Center Directs Science and Technology Quests

Have a question concerning science and technology—but you aren't sure who has the answer? The National Referral Center for Science and Technology may be able to direct you to the organization or individual with specialized knowledge on the particular question.

The Center, acting as an intermediary, is concerned with all fields of science and technology: the physical, biological, social, and engineering sciences, and the many technical areas related to them. Consequently, it is interested in all kinds of information resources: professional societies, university research bureaus and institutes, federal and state agencies, industrial laboratories, museum specimen collections, testing stations, individual experts, technical libraries, information and document centers, and abstracting and indexing services.

Operating in the Library of Congress, with the support of the National Science Foundation, the Center strives to "bring together those who ask and those who know." The service is free for those working in any field of the physical, biological, social, and engineering sciences.

The National Referral Center provides names, addresses, telephone numbers, and brief descriptions of related information resources.

In order for the Center to efficiently answer replies, the following information is requested: (1) a precise statement of the information desired, (2) statement of information resources already contacted, and (3) statement of special qualifications. By indicating special qualifications, (government contract, affiliation with research project, or membership in a professional society) the inquirer may be entitled to use resources otherwise not open to him.

Referral requests may be made by calling area code 202, 426-5670, by writing to the Library of Congress, National Referral Center for Science and Technology, Washington, D.C. 20540, or by visiting the Center on the fifth floor of the Library of Congress Annex, Second Street and Independence Avenue, SE.

General inquiries may be made by calling area code 202, 426-5687.

The Center solicits information contributions. Although a data form is available upon request, it is not mandatory. The following topics should be covered when contributing information: (1) subject coverage and specialization, (2) information functions and services, and (3) service conditions and restrictions. To register special capabilities with the Center, call area code 202, 426-5680 or write to the previously mentioned address.

Four directories have been issued by the Center and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402:

A Directory of Information Resources in the United States: Physical Sciences, Biological Sciences, Engineering ($2.25);

A Directory of Information Resources in the United States: Social Sciences ($1.50);

A Directory of Information Resources in the United States: Water ($1.50); **and**

A Directory of Information Resources in the United States: Federal Government ($2.75).

ERIC Publications Available

The following seven **ERIC** publications are now available:

Thesaurus of ERIC Descriptors

The August, 1970, 300-page, hard-cover edition is available at $8.95 a copy from CCM Information Corporation, 909 Third Avenue, New York, New York 10022. All newly-assigned descriptors and hierarchical displays as of July, 1970 are included.

A new feature of the 1970 issue is the Foreward, "The Role and Function of a Thesaurus on Education," by a noted expert in the vocabulary and communication field, Dr. Frederick Goodman of the University of Michigan.

Manpower Research Inventory for Fiscal Year 1969

This volume, which contains two groups of résumés, can be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 at $1.75 per copy. One group contains Manpower accession numbers MP 000 711—000 946 representing 236 document résumés newly added to the **ERIC** system. This group is available from **ERIC** Document Reproduction Service (EDRS), 4936 Fairmont Avenue, Bethesda, Maryland 20014, as the set of microfiche specifically from **Manpower Research Inventory for Fiscal Year 1969** at $70 per set. The second group contains Manpower accession numbers MP 000 947—001 042 consisting of 96 document résumés that have previously appeared in issues of **RIE**. To avoid duplication, this group will not be made into a separate set of microfiche.

Current Index to Journals in Education—Volume 1—Annual Cumulation—January-December 1969 (EJ 000 001—001 707)

This hard-cover Annual Cumulation, which cites 11,707 journal articles indexed in **CIJE**, Volume 1, Numbers 1-12 (January through December, 1969), is available from CCM at $24.50 a copy. Complete journal citations with each main entry and each title listed under a descriptor in the Subject Index are included.

Research in Education Semi-Annual Index: January-June 1970

GPO offers 5,054 **ERIC** reports (ED 031 605—036 658) at $3.25 a copy (order by title).

Education Cumulative Editions

This brochure contains information on **RIE** Annual Indexes from GPO (1967—1968—1969) and **RIE** Report Résumés published by the National Standards Association, Inc.

The ERIC Educational Documents Index

This Index, published by CCM, compiles for the first time references to research documents in the **ERIC** collection from **Research in Education**—1966 through 1969, **Office of Education Research Reports**—1956 through 1965, and **The ERIC Catalog of Selected Documents on the Disadvantaged**. It includes documents ED 001 001 through 031 604 and has complete titles and ED numbers listed with each entry in the Subject Index and the Author Index. The $34.50 set is available in two volumes, 1,600 pages, and library binding.

ERIC Products 1969-1970: A Bibliography of Information Analysis Publications of the ERIC Clearinghouses: July 1969—June 1970

The **ERIC** Clearinghouse on Library and Information Sciences compiles the **ERIC Products** annual bibliography of information analysis products generated by the 20 **ERIC** Clearinghouses. A list of 336 publications, including bibliographies, review papers, and state-of-the-art papers prepared by the clearinghouses during the fiscal year 1970 are included. This third issue can be obtained as long as the supply lasts from the **ERIC** headquarters office in Washington, D.C. It is also available from **ERIC** Document Reproduction Service by ordering by the noted ED number listed in **RIE**.

The first issue of **ERIC Products** lists 149 publications of the fiscal year 1968 and is available from EDRS as ED 029 161 (MF: $0.25 and HC: $1.30). The second edition lists 240 publications of the fiscal year 1969 and is available from EDRS as ED 034 089 (MF: $0.25 and HC: $1.80).

Engineers' Films Available

A 32-page booklet, **United States Army Corps of Engineers Motion Picture Films Available for Public Exhibition 1970**, is available from the:

Office, Chief of Engineers
ATTN: Public Affairs Office
Department of the Army
Washington, D.C. 20314.

The booklet is composed of two sections: (1) availability index and (2) a descriptive listing of the films available.

These 16mm films describe typical operations of the Corps of Engineers. There is no rental charge; however, the borrower must pay return postage.

Film titles include: "The Cape Cod Canal Story," "Fighters and Builders," "Flood Fighting Methods," "Greenland," "Invasion by Oil," "Man on the Moon," "New Look for Niagara," and "When Disaster Strikes."

The ERIC Information Analysis Center for Science and Mathematics Education will be producing separate newsletters for three interest groups. After March 1, 1971 newsletters will be mailed only to persons who have returned an address form.

1. Please indicate which newsletter(s) you want to receive.
   _____ Environmental Education
   _____ Science Education
   _____ Mathematics Education
2. Name _____
   Address _____
   City _____ State _____
   Zip Code (for U.S.) _____ Foreign Country _____
3. Current Position
   Title _____

Clip and mail to: ERIC Information Analysis Center for
Science and Mathematics Education
1460 West Lane Avenue
Columbus, Ohio 43210

Geological Survey Materials Available

Several topographic and geologic publications, maps and charts, and films are available from the U.S. Department of the Interior/Geological Survey.

Popular Publications are intended to answer public inquiries concerning the earth sciences and the activities of the Geological Survey. Available leaflets include: "United States Geological Survey," "Topographic Maps," "Topographic Maps—Silent Guides for Outdoorsmen," "Volcanoes," "Volcanoes of the United States," "The Antarctic and Its Geology," "The Great Ice Age," "Our Changing Continent," "The Amazon—Measuring a Mighty River," "The Potomac—Its Water Resources," "What is Water?," "Water and Industry," "Why is the Ocean Salty?," "Collecting Rocks," "Prospecting for Gold in the United States," "The San Andreas Fault," "Mountains and Plains—Denver's Geologic Setting," "Astrogeology," "Engineering Geology," and "Gold."

Booklets available include: **Exploration Assistance, Earthquakes,** and **Suggestions for Prospecting.**

The bulletin, **Popular Publications,** is available free upon request to:

The Information Office
Geological Survey
Washington, D.C. 20242.

Public Inquiries Offices are located in Anchorage, Alaska; Los Angeles, California; San Francisco, California; Denver, Colorado; Dallas, Texas; Salt Lake City, Utah; and Spokane, Washington. Each office, acting as an agency of the Superintendent of Documents, sells (over-the-counter) Survey maps (topographic and geologic) and reports for its specific area and distributes free information literature about Survey activities. Each office also has a library of Survey publications and is a despository for selected, open-file reports.

Mail orders for maps of areas east of the Mississippi River should be sent to:

Distribution Section
U.S. Geological Survey
1200 South Eads Street
Arlington, Virginia 22202.

Map orders for areas west of the Mississippi River should be sent to:

Distribution Section
Denver Federal Center
Denver, Colorado 80225.

Mail orders for sales book publications should be sent to the:

Superintendent of Documents
Government Printing Office
Washington, D. C. 20402.

Films dealing with geology, topographic mapping, and water resources are available to educational institutions, engineering and scientific societies, and industrial and civic groups. Requests for further information on the loaning of films may be obtained by writing to:

The Information Office
Geological Survey
Washington, D. C. 20242.

Most films are 16-millimeter with color and sound. Films available include: "Alaska Earthquake, 1964," "Airborne Magnetometer," "Eruption of Kilauea, 1959-60," "The 1955 Eruption of Kilauea," "Leveling for Topographic Mapping," "Transit Traverse for Topographic Mapping," "Negative Scribing for Map Reproduction," "Tellurometer," "ABC System," "The Sea River," "The Little Plover (River) Project, A Study in Sand Plains Hydrology." "The Water Below," "Introduction to Photo Interpretation," "Aerial Photo Interpretation of Hydrological Resources," and "Aerial Photo Interpretation of Geologic Resources."

A monthly announcement, **New Publications of the Geological Survey,** is available without charge on request to the: Geological Survey, Washington, D.C. 20242.

Individualized Instruction Is Possible with PREP

Individualizing instruction in the classroom can be accomplished with the U.S. Office of Education's latest PREP (Putting Research into Educational Practice). The 13-document kit deals with every aspect of individualized instruction, including: objectives, diagnosis, instruction, evaluation, testing, case studies, problems encountered, and advice on how to get started.

PREP notes there are several ways to individualize instruction. In fact, U.S.O.E.'s National Center for Educational Communication funded the preparation of 46 case studies describing actual programs of individualized instruction in schools from 24 states. Case studies may be ordered from:

ERIC Clearinghouse on Educational
Media and Technology
Institute for Communications Research
Stanford University
Stanford, California 94305.

Approaches to individualized instruction usually fall into four categories:

INDIVIDUALLY DIAGNOSED AND PRESCRIBED—"These have clearly specified behavioral objectives, with definite materials and methods used to meet them. The best example of this approach is IPI (Individually Prescribed Instruction) developed by Research for Better Schools, Inc."

SELF-DIRECTED—"Here teachers work with the students in establishing particular goals, but leave the choice of materials and methods for reaching the goals largely to the students themselves. This approach is most frequently used with above-average learners."

PERSONALIZED—"The learner chooses his own objectives, then follows a directed program with specialized materials. Generally found in science, social studies, and elective courses. More often used in secondary schools."

INDEPENDENT STUDY—"The learner decides his own objectives and the means to attain them. Like the self-directed programs, independent study is usually used with above-average students."

PREP considers the following, advantages of individualized instruction: "generally positive response by students; harder working and more satisfied teachers; reduction in disciplinary problems and improvement in attendance; students show renewed interest in school, thereby rekindling the interest of parents and the community; and more efficient use of teachers and other staff tends to reduce cost."

Findings on the problems encountered with this type of instruction include: teachers dissatisfied (they believe unreasonable demands are being placed upon them and they lack sufficient training); parents disappointed (those in affluent areas feel their expectations of what the school should demand of its students were not being met); shortage of available individualized instructional materials; resistance of the establishment to anything new or different.

To obtain PREP Kit #16, Individualized Instruction, write:

ERIC Document Reproduction Service (EDRS)
4936 Fairmont Avenue
Bethesda, Maryland 20014.

Interdisciplinary Meeting Announced

The Mathematics Education Research Group (MERG) at the University of Pennsylvania announces the Second Annual Interdisciplinary Meeting on Mathematics and Structural Learning will be held April 2-3, 1971. All scientists and other interested persons are invited.

Co-sponsors are AERA Interest Group on Structural Learning; Centre de Recherches En Psycho-Mathematique; AERA Interest Group for Research in Mathematical Education; and Graduate Group, Computer Science. Meeting will be informal.

Send reservations to:

Dr. Joseph M. Scandura
Graduate School of Education
University of Pennsylvania
Philadelphia, Pennsylvania 19104

Clearinghouse Publishes Announcements and Selective Bibliographies

ANNOUNCEMENTS

The Clearinghouse for Federal Scientific and Technical Information publishes semimonthly announcements in 35 separate fields of technology. Annual subscription rate per category is $5.00; foreign rate, $6.25. A maximum of $125.00 ($156.25 foreign) is charged for all categories.

Mail orders to:

Clearinghouse (152.12)
U.S. Department of Commerce
Springfield, Virginia 22151.

Announcements include the latest information about unclassified reports sponsored by the U.S. Government and others—Science, Technology, Commerce, Business, and the Social Sciences. Featured are new groupings to accommodate recent changes in research trends and new subcategories for more rapid scanning.

SELECTIVE BIBLIOGRAPHIES

The clearinghouse also produces selective bibliographies, covering such popular subjects as **Environmental Pollution.** Topics included in this particular bibliography are: Air Pollution; Air Pollution, Engine Exhausts; Air Pollution, Sulfur Oxides; Noise Pollution; Pesticides; Population; Radioactive Contamination; Wastes, General; Wastes, Treatment; Water Pollution, General; Water Pollution, Oil; and Water Pollution, Thermal.

Most of the reports listed in the bibliography result from federally sponsored research by governmental departments and agencies. Most of the reports are available from the clearinghouse.

For further information on these publications write to the Information Services Section of the previously given clearinghouse address.

Analysis of APC Tablets Available in FDA Booklet

Qualitative Analysis of APC Tablets, an 8-page booklet written by the Educational Services Staff of the Food and Drug Administration (FDA), is available at $0.10 a copy from:

The Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402.

Techniques used in this senior high school chemistry designed booklet are column chromatography and color reactions. The method was developed by the FDA and is now officially employed in the National Formulary.

A bibliography is included in the booklet, FDA Publication No. 53.

PREP Brief on Microteaching Available

PREP Brief No. 17, which explains the teacher-training technique called microteaching, is available from:

PREP Brief No. 17
U.S. Office of Education (DHEW)
National Center for Educational Communication
400 Maryland Avenue, SW
Washington, D.C. 20202.

"Microteaching is a teaching situation which is scaled down in terms of time and numbers of students—usually a 4- to 20-minute lesson involving 3 to 10 students. By scaling down the lesson, some of the complexities of the teaching act are reduced, allowing the teacher to focus on selected aspects of teaching. The technique focuses on the teacher mastering one teaching skill at a time—thus the teaching is 'micro.' "

Topics covered include: What Is Microteaching?, The Development of Teaching Skills Through Microteaching, Some Noted Advantages of Microteaching, Uses of Microteaching, and For More Information.

How to Make Students Behave?

Reinforcing Productive Classroom Behavior—A Teacher's Guide to Behavior Modification is the topic of **PREP Brief No. 18.** The Brief is available from:

PREP Brief No. 18
U.S. Office of Education (DHEW)
National Center for Education Communication
400 Maryland Avenue, SW
Washington, D.C. 20202.

Principles of behavior modification listed include: (1) behavior is influenced by its consequences and (2) a teacher's behavior influences a pupil's behavior. Five steps noted in achieving behavior modification are: (1) establishing reasonable and ethical goals, (2) making class rules, (3) observing and recording behavior, (4) increasing productive behavior, and (5) decreasing unproductive behavior.

Reinforcing Productive Classroom Behavior, containing an interpretive studies project on applying reinforcement principles in the classroom conducted by Dr. Edward Glaser of the Human Interaction Research Institute, Los Angeles, California, and Dr. Irwin G. Sarason of the University of Washington, Seattle for the U.S. Office of Education, will soon be available from:

ERIC Document Reproduction Service (EDRS)
The National Cash Register Company
4936 Fairmont Blvd.
Bethesda, Maryland 20014.

PREP Kit #18, developed from the teacher's guide, will also be available from EDRS.

SMAC
NEWSLETTER
ERIC

"Ripples" Project Utilizes T.V.

"Ripples," an educational television series of thirty-six 15-minute color programs for kindergarten and first and second grades, has been initiated and coordinated by the National Instructional Television Center. These programs were produced by the Northern Virginia Educational Television Association, Annandale, Virginia.

"Like a pebble dropped into still water that sets the water gently swirling, each encounter in 'Ripples' sets a child's thoughts and feelings in motion, sparks his curiosity and interest in himself and his world . . ." This is the purpose of "Ripples" according to Mrs. Ruth S. Pollak, educational director and producer of the series.

The series strives to:

(1) Help children build human values.
(2) Extend their knowledge.
(3) Increase their aesthetic sensitivity.
(4) Help them understand the changing nature of the real world.

Programs in the series include: "Animals Need You," "Checkup," "Everybody's Different," "How Did I Get to Be Me?," "Out to the Moon," "Seeds," "Take a Good Look," and "Touching in the World."

Three 30-minute inservice programs accompany the series. **Television Guidelines for Early Childhood Education** by Rose Mukerji is also alvailable from NIT.

Preview materials consist of "Going to the Hospital," "Feeling Spaces," a third program, and one copy of the **Guide for Ripples.** Preview programs are available on 16mm film. One or more of the preview programs are also available on Ampex 1" helical scan and quadruplex format video tapes. Tape previews are sent whenever 16mm programs are unavailable or when the user requests them. Previews are available free upon request. A handling charge of $7.50 per program is made when a user requests materials other than or in addition to the standard preview materials.

For further ordering information, write:

Field Services
National Instructional Television
Box A
Bloomington, Indiana 47401
Phone: (812) 339-2203

NIT Eastern Office
Suite 217
1346 Connecticut Avenue, N.W.
Washington, D.C. 20036
Phone: (202) 332-9262

NIT Midwestern Office
910 Elm Grove Road
Elm Grove, Wisconsin 53122
Phone: (414) 786-9230

NIT Western Office
Suite 201
113 El Camino Real
Millbrae, California 94030
Phone: (415) 697-6441.

T.V. Program Explores Science

Let's Explore Science, fourteen 15-minute science lessons designed for grades 4, 5, and 6, has been developed by the Portland (Oregon) Public Schools at KOAP-TV in Portland. Peter H. Taylor is the television teacher.

"By helping students to see their world through the eyes of an investigator, **Let's Explore Science** reveals the joy of self-discovery through scientific experimentation," a Great Plains National Instructional Television Library release stated.

Approaches such as, "the discovery method," "the inquiry approach," and "emphasizing process rather than product" are investigated and used in **Let's Explore Science.**

Lesson summaries quoted from the release are:

(1) How Do You Know?—explores the role of the senses in learning and in scientific observation.
(2) Sorting Things—deals with organizing and classifying materials.
(3) Extending Our Senses—explores the problem of extending the senses by using instruments.
(4) What Do You Do with Numbers?—discusses the use of measurement and graphing.
(5) Hunches and Guesses—examines the use of hypotheses and prediction in scientific research.
(6) Exploring Gases—investigates some ways of collecting and preparing gases.
(7) Crystal Clear—explores the process of experimenting.
(8) Push and Pull—looks at the importance of making useful definitions.
(9) The Magnet Earth—explains ways to interpret data.
(10) Hot and Cold—explores ways to communicate.
(11) What Do You Think?—investigates the value of prediction.
(12) Exploring Plants—points out the value of experimenting with one variable at a time where possible.
(13) Seesaws, Slides and Swings—uses various levers to point up the importance of space-time comparisons.
(14) Drawing a Picture of Nature—explains how learning may be increased when conceptual models are drawn.

A 30-minute in-service utilization program, explaining the philosophy behind the development of the telecourse, is available for teachers and principals.

Sample previews are available on either quadruplex video tape or kinescope. A sample copy of the teacher's guide may also be evaluated.

For further information write:

Great Plains National Instructional
Television Library
University of Nebraska
Lincoln, Nebraska 68508.

SE 017 935

CIJE Continues to Grow

Current Index to Journals in Education (CIJE) has been expanded to include more than 550 educational publications—journals, quarterlies, annuals, and yearbooks. Brief annotations outlining the scope and substance of approximately 1,000 articles are included in the journal each month.

Publications currently being received for **CIJE**, of special interest to readers of this Newsletter, include:

*1. American Biology Teacher
2. American Journal of Physics
*3. Arithmetic Teacher
4. Australian Science Teachers Journal
5. Biology and Human Affairs
6. BioScience
7. Bulletin of the Atomic Scientists
8. Conservationist
9. Education in Chemistry
*10. Educational Studies in Mathematics
11. Geotimes
12. Impact of Science on Society
13. Journal of Biological Education
14. Journal of Chemical Education
15. Journal of Geological Education
16. Journal of Research in Mathematics Education
*17. Journal of Research in Science Teaching
18. Mathematical Gazette
19. Mathematical Spectrum
*20. Mathematics Teacher
21. Mathematics Teaching
*22. National Council of Teachers of Mathematics. Yearbook
23. Physics Education
*24. Physics Teacher
25. Physics Today
*26. School Science and Mathematics
27. Science
*28. Science and Children
*29. Science Education
*30. Science Teacher
31. Two-Year College Mathematics Journal

* Journals indexed cover to cover.

The subscription rate for **CIJE** (monthly) is $34.00 a year. The **Index** plus semi-annual and annual cumulations are $65.00 a year. Cumulations may be ordered separately.

Subscriptions, requests for a sample copy, or requests for information should be sent to:

CCM Information Corporation
909 Third Avenue
Department XX
New York, New York 10022.

Psychology Materials Available

The American Psychology Association will be operating a clearinghouse for information on the teaching of psychology and behavioral science at the precollege level.

Curriculum materials, such as syllabi, bibliographies, audio-visual aids, texts, course and unit outlines, and supplemental reading books will be included in the clearinghouse. Information on teacher training and certification in psychology will also be available. A newsletter for high school teachers of psychology will begin publication in the fall.

Professionals interested in submitting clearinghouse materials, should contact:

Margo Johnson
American Psychology Association
1200 17th Street, N.W.
Washington, D.C. 20036.

Atomic Energy Materials Available

Free atomic energy educational materials and teaching aids for the use of students, teachers, and others are available from:

The U.S. Atomic Energy Commission
P.O. Box 62
Oak Ridge, Tennessee 37830.

The **Understanding the Atom** series is a group of booklets devoted to various aspects of nuclear science and technology. Teachers and librarians may obtain the complete series; students are limited to three titles.

Packets for use in general science, biology, chemistry, and physics are available to high school science teachers. The teacher's interest, use intended, and grade level are requested when ordering.

More than 150 educational motion pictures may be borrowed without charge by schools or other groups from U.S. AEC film libraries. A catalog describing these films is available on request.

Five documentaries on the peaceful use of atomic energy and two technical films have been added to the AEC's free-loan film libraries. The 16mm color films are: "The Atom: Year of Purpose," "No Greater Challenge," "Molecular Biology: An Introduction," "The Warm Coat," "The Atom Underground," "Computer Fluid Dynamics," and "The Safe Handling of Enriched Uranium."

Catalog Lists AEC Films

Combined Film Catalog contains 347 U.S. Atomic Energy Commission free-loan films available upon request to public nonprofit organizations. The 1970 revised listing of 16mm films includes three film collections: Education-Information, Technical-Professional, and Historical.

A list of subject categories and an index of titles appear before each part of the catalog. A complete index of all the films is included.

Part One: Education-Information is designed for the general public, schools, television stations, colleges, and universities. Such subjects as: Biology and Agriculture, Careers, Industrial Applications, Peaceful Uses, Power Reactors, and Principles of Atomic Energy are covered.

Part Two: Technical-Professional is intended for colleges, universities, industries, researchists, scientists, engineers, and technologists. Subjects covered include: Engineering, Fuels, Medicine, Peaceful Nuclear Explosives, Physical Research, and Space Program: Rover and Snap.

Part Three: Historical are out-of-date films, but reflect scientific developments that may be useful to those interested in the development of atomic energy.

Classroom Films on Nuclear Science, another AEC film catalog, is available to teachers.

Copies of the catalogs are available from:

Audio-Visual Branch
U.S. Atomic Energy Commission
Washington, D.C. 20545

OR

Technical Information Extension
U.S. Atomic Energy Commission
P.O. Box 62
Oak Ridge, Tennessee 37830.

Academy for Educational Development Produces University Management Aids

The nation's colleges and universities are in need of financial and management improvements according to Dr. Alvin C. Eurich, president of the non-profit Academy for Educational Development.

* * * * *

After spending two years developing a feasibility study and interviewing several hundred college and university presidents, Avery Raube, vice president of The Conference Board (formerly the National Industrial Conference Board) found the following opinion to be supported by a majority of those interviewed—

In order for institutions of higher education to continue (after 1985) educating everyone who wants and needs such knowledge, modern management methods and technical guidance (provided in the form of a management advisory group) must be available to college and university presidents to improve the administration.

* * * * *

Consequently, the Academy formed a new unit called the Higher Education Management Division to "conduct research, organize conferences and training programs, and disseminate information through several kinds of publications and media."

Technical guidance and specialized management information will be available to the new agency from The Conference Board, a leading business and economic fact-finding organization. This effort will supplement input by other national organizations such as the American Council on Education and the Association of Governing Boards of Universities and Colleges.

Financing for the new operation includes grants from the W.K. Kellogg Foundation; John M. Olin, honorary chairman of the Olin Corporation; and other non-governmental sources.

A primary objective will be to encourage institutions to get the most from the money within the existing budget, how to make the endowment go further, and how to tap new sources of support.

Management problems the new agency will study include: assignment of responsibility and authority; clarification of the purpose and function of various kinds of institutions; organization and structure of colleges and universities; roles of trustees, regents, presidents, faculty, and students; teaching, curricula, and learning problems; personnel policies; long-range planning, financing, budgeting, and development; facilities development and campus planning; maintenance and security; management of auxiliary enterprises; and community and alumni relations.

A policy panel of distinguished authorities from education and business, which will advise Dr. Eurich, director of the new unit, is being formed.

For further information, write:

Mr. Ronald Gross
Academy for Educational Development, Inc.
437 Madison Avenue
New York, New York 10022
Phone: (212) 758-5454

OR

Mr. Sidney Tickton
Academy for Educational Development, Inc.
Embassy Building
1424 Sixteenth Street, N.W.
Washington, D.C. 20036
Phone: (202) 265-5576

The ERIC Information Analysis Center for Science and Mathematics Education will be producing separate newsletters for three interest groups. After April 1, 1971 newsletters will be mailed only to persons who have returned an address form.

1. Please indicate which newsletter(s) you want to receive.
   _____ Environmental Education
   _____ Science Education
   _____ Mathematics Education
2. Name _____
   Address _____
   City _____ State _____
   Zip Code (for U.S.) _____ Foreign Country _____
3. Current Position
   Title _____

Clip and mail to: ERIC Information Analysis Center for
Science and Mathematics Education
1460 West Lane Avenue
Columbus, Ohio 43210

Aerial Photos Available

A collection of 20,000 aerial photographic maps of arable land in 3,000 counties of the United States has been produced by the Agricultural Stabilization and Conservation Service (ASCS). The aerial photographs were made between 1940-1958 and will be added to the National Agricultural Library. ASCS plans to add about 1,000 photographs to the collection annually.

Agricultural scientists and researchers may study the collection at:

National Agricultural Library
Beltsville, Maryland 20705.

U.S. Atlas Available

The National Atlas of the United States, a comprehensive atlas depicting the salient characteristics of the U.S., is available for $100 per copy from:

U.S. Geological Survey
Washington, D.C. 20242.

The 14-pound hard cover atlas includes an index with more than 41,000 entries including geographic coordinates, a finding code, and, where appropriate, the population of places named.

General reference and thematic maps describing the nation's physical characteristics, history, economic and social status, administrative subdivisions and map coverage are featured. Introductory pages contain general reference maps of the U.S., in addition to detailed and indexed sectional maps.

Eight years of planning and preparation, involving the joint efforts of more than 80 federal agencies, commercial firms, specialists and consultants was culminated with the release of this publication.

Booklets Explain Nuclear Energy

The Atomic Energy Commission has developed a new series of booklets, **World of the Atom,** for junior high school students and their teachers explaining nuclear energy.

The **World of the Atom** series complements the **Understanding the Atom** booklet series for senior high school students and adults. Both series are illustrated and include a reference list of additional materials.

Titles published to date in the **World of the Atom** series are "Atomic Pioneers" and "The Mysterious Box: Nuclear Science and Art." Subjects to be covered in the next twelve months include: "Nature's Invisible Rays," "Preserving Food with Atomic Rays," "Atomic Energy and Your World," and "The Mystery of Matter."

" 'Atomic Pioneers,' Book 1 is the first of a group of four biographical booklets that will describe the contributions to atomic science made by 100 men and women over a 2550-year time span. Book 1 covers the period from 5 B.C. to the middle of the nineteenth century. 'The Mysterious Box' presents, in short-story form, the nuclear methods used to establish the age and authenticity of oil paintings."

Single copies of the two booklets in the **World of the Atom** series are available free of charge from:

USAEC—Technical Information
P.O. Box 62
Oak Ridge, Tennessee 37830.

Publication Contains Survey

Results of a survey showing salaries are rising despite the national economic lull are documented in the publication, **Prospects of Engineering and Technology Graduates —1970.** Copies of the survey are available for $2.00 from:

Engineers Joint Council
Department "PT"
345 East 47 Street
New York, New York 10017.

NASA Pamphlets and Films Available

PUBLICATIONS

NASA Educational Publications, a 13-page pamphlet listing educational and informational publications which explain the National Aeronautics and Space Administration's goals, projects, and advances in science and technology, is available from:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402.

Educational publications listed include curriculum resource materials and guidance resource materials. Thirty educational booklets are listed, including such titles as: "Report from Mars," "Linking Man and Spacecraft," "The Planetarium: an Elementary-School Teaching Resource," "Model Spacecraft Construction," "Space Jobs," and "Aerospace Bibliography: 4th Edition."

Eighteen topics are covered in the **NASA Facts** booklets. These booklets describe a NASA program (Apollo, Lunar Orbiter, etc.) or discuss techniques (Space Navigation, Living in Space). Some are wall display sheets (Saturn V).

Six subjects are covered in the **NASA Facts Science** series. These fact sheets are designed for elementary, junior high or senior high classrooms. Each issue is four pages and designed to fit in the standard size three ring notebook. Illustrations and diagrams are line drawings, which can be reproduced.

NASA Facts Organization series describes the functions and organization of the NASA Centers. They are available free of charge from the Educational Office at the NASA Center which is designated to serve your state. (Centers are listed in pamphlet.)

Six classroom picture sets are explained in the **NASA Educational Publications** pamphlet. One classroom poster set is available.

FILMS

A NASA Film List, listing films which describe NASA research and development programs in space and aeronautics and documenting the results of this research, can also be ordered from the previously mentioned address of the Superintendent of Documents.

Forty-seven NASA films of general interest are listed. Topics covered include: "America in Space: The First Decade," "The Clouds of Venus," "Food for Space Travelers," and "The John Glenn Story."

Several educational and special interest films for non-technical audiences are listed.

Six adventures in research films, used for career counselling, are available.

Eight filmstrips, including such subjects as—"Geology from Space," and "Nuclear Propulsion in Space"—are available.

To borrow films or filmstrips, U.S. residents should write to the appropriate NASA Regional Film Library. (Addresses are listed in the pamphlet.)

REACT Training Packages Available in Math and Science

The Northwest Regional Educational Laboratory has developed a REACT (Relevant Educational Applications of Computer Technology) Training Package series. The series demonstrates ways the computer can be used in school administration and instruction.

Training packages are organized into separate courses for school administrators and teachers.

Course I provides an introduction; Course II, administrators applications; Course II, teacher application units from various subject areas; and Course III, implementation.

Units of mathematics application (Course II, teachers) are:

Unit 11—Retail Discount
Unit 12—Compound Interest
Unit 13—Arithmetic Average and Percent Rank
Unit 14—True Annual Interest Rate
Unit 15—Installment Loans
Unit 16—Properties of Operations
Unit 17—Linear Equations and Their Graphs
Unit 18—Quadratic Formula
Unit 19—Triangle Midpoints Theorem
Unit 20—Equations of the form $y=AX^2+BX+C$
Unit 21—Law of Sines
Unit 22—Law of Cosines
Unit 23—Functions and their Graphs
Unit 24—Best Line Fit for a Set of Points

"Retail Discount, Compound Interest and Arithmetic Average are units which could be written by a student in a general mathematics course. If the student understands the theory of solving this type of problem, he can use the computer for time consuming calculations.

Units on True Annual Interest Rate and Installment Loans can be utilized in a general mathematics course to develop students' understanding of monthly interest, carrying charges, true annual rate of interest, etc.

The unit on Properties of Operations can be used to increase students' understanding of the meaning of the commutative and associate properties.

The Linear Equations unit can be used to give students the opportunity to discover and explore relationships betweeen a linear equation and its graph prior to a formal class discussion of slope and intercepts.

The Quadratic Formula unit illustrates how a computer program can increase a students' understanding of a mathematical concept by permitting him to process a great many examples with a minimum of effort.

The unit on Triangle Midpoints contains a computer program which accepts the coordinates of the three vertices of a triangle and then calculates the lengths, slopes and midpoints of the sides of a triangle, and the lengths and slopes of the line segments joining the midpoints.

Using the computer program in the unit on Equations of the form $y=AX^2+BX+C$, the student concentrates on discovering relationships and patterns, rather than on doing calculations.

Units on the Law of Sines and Cosines avoid the tedious calculation of numbers to four or six place decimals in developing students' understanding of problem solving procedures.

The program in the unit on Functions allows students to investigate the relationship between graphs and various equations.

The unit on Best Line Fit for a Set of Points illustrates the use of a computer program in advanced algebra to calculate the slope and y-intercept values for a linear equation." (Quoted from the **Northwest Report**, December, 1970.)

Units of science application (Course II, teachers) are:

Unit 25—Mass, Volume, Density Relationships
Unit 26—Law of the Pendulum
Unit 27—Genetics
Unit 28—Photosynthesis
Unit 29—Auxin Concentration in Plants
Unit 30—Radioactive Decay
Unit 31—Gas Laws
Unit 32—Photoelectric Effect
Unit 33—Coulomb's Law of Electrostatics
Unit 34—Free Falling Bodies
Unit 35—Projectile Motion
Unit 36—Measuring Surfaces and Volumes
Unit 37—Mean, Variance, Standard Deviation, Standard Error of the Mean T-Test

"The unit on Mass, Volume, Density Relationships allows a student to simulate an increase or decrease for a material of his choice. The computer then prints out a table for each simulation for the student to use in preparing a graph of volume vs. density or mass vs. density.

The Law of the Pendulum unit allows the student to simulate an experiment with the motion of a pendulum to determine which variables affect the period of swing.

The Genetics unit makes it possible to simulate genetic experiments and show how various characteristics of parents are passed on to the subsequent generations.

The Photosynthesis unit illustrates the use of a computer to calculate the rate of photosynthesis based on intensity of light and concentration of carbon dioxide.

The biology unit on Auxin Concentration in Plants demonstrates how the computer can be used to examine the relationship between auxin concentration and light intensity.

Chemistry students are able to calculate the half-life of a Radioactive Decay unit.

Quantitative forms of laws governing the behavior of gas can be explored by chemistry students in the Gas Law unit.

Students can specify the rate of diffusion and molecular weight of a gas in studying Graham's Law of Diffusion.

The computer program in the Photoelectric Effect unit allows students to select any one of five metals and to control a simulated exposure of the metal to ultraviolet radiation.

Physics students can specify two electrostatic charges and a distance between them to calculate force in the unit Law of Electrostatics.

The computer program in the unit on Free Falling Bodies allows students to specify variables in calculating velocity.

In studying Projectile Motion, students can designate the initial velocity and launch angle for a projectile in calculating its range and track.

The computer program for the unit on Measuring Surfaces and Volumes allows the students to find the thickness of a thin layer of a substance such as oil, soap or paint on the basis of the volume and area it covers.

The computer program for the unit on Mean, Variance, Standard Deviation, Standard Error of the Mean and T-Test makes it possible for the student to solve any of these formula in connection with science experiments." (Also quoted from the **Northwest Report**, December, 1970.)

SMAC Science & Mathematics Education Information Analysis Center
NEWSLETTER
AN ERIC CENTER
Science Education — Volume 3, Number 4

NSTA Initiates College Journal

The National Science Teachers Association will begin publication of the **Journal of College Science Teaching** October, 1971.

The **Journal**, a quarterly directed to science faculty at the college level, will publish full-length articles as well as news sections covering national and legislative news, abstracts from other journals, and reviews of books and other instructional materials and equipment. It will carry advertising.

Dr. Leo Schubert, head of the Chemistry Department at the American University, Washington, D.C., will edit the new quarterly. Miss Susanne C. Nance, formerly with Ziff-Davis Publishing Company in Washington, D.C., will be managing editor.

The **Journal** will deal "mainly with science programs in general education; that is, for students who wish to take some science but may not be planning to major in one of the sciences."

Subscription rates are $8.00 per year to members of NSTA and $10.00 per year to nonmembers and libraries.

For further information, write:

Mary E. Hawkins
National Science Teachers Association News
1201 Sixteenth Street, N.W.
Washington, D.C. 20036.

Publication Lists Educational Information Resources

Over 200 educational information resource centers are announced in the **Directory of Educational Information Resources** compiled by Judy Wanger of the Systems Development Corporation, Falls Church, Virginia. The 189-page hardback book is available from:

CCM Information Corporation
909 Third Avenue
New York, New York 10022.

This 1971 directory is a revised and updated edition of the **Directory of Educational Information Centers** (U.S. Government Printing Office, 1969). The scope has been broadened with respect to the levels and kinds of information centers identified. "The principal population surveyed by questionnaire for the purpose of this compilation included those institutions and agencies that have come to be identified as sponsors of educational information centers. In addition, national education organizations and associations that were considered potential sources of information service (above any normal degree of publication preparation or consultative service) were surveyed."

The main sections of the directory are: "Local Resources," identifying state and local centers; "National Resources," comprising selected organizations and agencies which serve educators in a multi-state area or throughout the nation (**ERIC**—Educational Resources Information Center, the U.S. Office of Education Regional Offices, U.S. Office of Education Sponsored Programs, National Associations, and National Information Centers are grouped separately within this section); and "Guides to Organizational Resources in Education," (a new section) providing references to sources of more specialized information.

Information provided on each entry includes: name of center, address and telephone, name and title of director and or head of information services, founding date, sponsor or parent organization, purpose, services and products, users, and holdings.

An index is also included.

Science Teacher Education Project Releases Publications

The Science Teacher Education Project is a three-year curriculum development project on methods of training science teachers. The Project is funded by the Nuffield Foundation as of December, 1969.

Funds are used to enable groups of teachers, most of whom are tutors in Departments and Colleges of Education, to develop small curriculum units on methods of teaching science. A major characteristic of the units is that they involve student-teachers in active study, for example, in devising teaching materials, teaching in small teams, analyzing pupils' writings, or by close structured observation of films of teacher and pupils at work. Video tapes, sound recordings, and reproductions of pupils' work are an integral part of the materials produced.

The three-year plan is as follows:

1970 — (1) Contribution of suggestions for activities for students.
(2) Topic groups devise curriculum units based on these.
(3) Production of resource materials.

1970 September to 1971 August —
Trial of sample units and of evaluation procedures.

1971 September to 1972 August —
Main trial with concurrent evaluation.

1972 December —
Publication of materials and evaluation data.

Information Bulletins 1 and **2**, published February, 1970 and the summer of 1970 respectively, are available. To obtain these **Bulletins** or for further information, write either of the coordinators:

Dr. J. T. Haysom
School of Education
University of Reading
24 London Road
Reading RG1 5AQ
England
OR
D. C. R. Sutton
School of Education
University of Leicester
21 University Road
Leicester LE1 7RF
England.

SE 017 935

ERIC Products Available

The following new **ERIC** publications are available:

The ERIC Educational Documents Index, 1966-1969

This two-volume work provides a cumulative subject and author index to cover approximately 25,000 documents in the **ERIC** system. Each subject heading and author entry is followed by a complete title and accession number of the appropriate document. This publication, compiled and published in 1970, costs $34.50 and is available from:

CCM Information Corporation
909 Third Avenue
Department XX
New York, New York 10022.

Complete Guide and Index to ERIC Reports through December 1969

As a cumulative index, this volume lists individual **ERIC** accession numbers under appropriate subject terms, by author and by the **ERIC** clearinghouse that processed them originally, and provides the full title, by accession number for nearly 25,000 **ERIC** reports announced through December, 1969. Costing $35.00 a volume, this publication is available from:

Prentice-Hall, Inc.
Englewood Cliffs, New Jersey 07632.

CIJE Semi-Annual Cumulation (January-June, 1970)

Available for $12.50 per copy, this volume provides cumulative indexes to 7,725 periodical citations (EJ 011 708—EJ 019 432) in **Current Index to Journals in Education.** It is also available from the CCM Information Corporation.

The 1970 Thesaurus of ERIC Descriptors

Over 4,700 terms are listed as descriptor groups and in a rotated descriptor display. The Thesaurus includes a 28-page discussion by Dr. Fred Goodman, University of Michigan, on "The Role and Function of the Thesaurus in Education." This 1970 publication costs $8.95 per copy and is available from CCM Information Corporation.

New CIJE Format

A new section, "Journal Contents Index," has been added to CIJE as of January, 1971. The section provides the titles and EJ numbers for all journal issues indexed for a given month. Titles of articles appearing in the particular issue of a journal appear under each journal heading. A quick survey of the contents of all journals reviewed by CIJE is thus provided.

A second change in format is in the "Source Journal Index." Due to frequent changes in subscription information, addresses and other ordering information will no longer be provided. However, CCM Information Corporation will continue to maintain this information on an up-to-date basis and will provide information upon request.

ERIC Tapes Available

Master magnetic tapes containing document records reported in **Research in Education** and **Current Index to Journals in Education** can be purchased at nominal cost. A software package called QUERY is also available for computer searching of **ERIC** tapes. For information, write:

James L. Eller
ERIC
National Center for Educational Communication
Office of Education
Washington, D.C. 20202.

ERIC Growth and Use Continues Rising

Growth of **ERIC** products and services has increased and thus the system is being recognized and used by more educationally interested people.

A few comparisons between activity levels in years ending June 1967—the second full year of operation—and June 1970—the most recently ended fiscal year—show rapid expansion and use of **ERIC.**

The following statistics were prepared by the National Center for Educational Communication, U.S. Office of Education.

General Activity Levels	1967	1970	Percent Increase
New documents added	3,500	24,427	589
Total collection of screened documents	5,200	55,000	958
Number of **ERIC** reports sold in microfiche (by titles)	800,000	6,200,000	675
Number of **ERIC** reports sold in hardcopy (by titles)	2,000	50,000	2,400
Number of organizations purchasing all **ERIC** microfiche	40	350	775
Number of bibliographies, reviews, state-of-art reports and other new reports generated by **ERIC** clearinghouses	149*	332	123
Number of **ERIC** dissemination columns in professional journals	13*	44	238
Initial circulation of journals having **ERIC** columns	283,000*	505,000	78
Circulation of newsletters produced by **ERIC** clearinghouses	56,606*	88,000	55
Questions answered by **ERIC** clearinghouses	33,000*	56,351	71
Number of users of **ERIC** master magnetic tapes	0	58	—

*Based on 1968—the earliest available year

Other Facts

Purchasers of all **ERIC** microfiche (N=350)	Percent
University or college libraries	73
State and local educational agencies	21
Foreign institutions	4
Other	2
	100

Subscribers to **Research in Education** (N=4,000)	
Institutions of higher education	35
State and local educational agencies*	32
Foreign institutions	6
Other domestic	27
	100

*In addition, 1,000 copies are distributed free.

Requestors of information from clearinghouses (N=56,351)	Percent
Educational practitioners	45
Educational decision-makers	14
Information specialists	13
R&D specialists	7
Professional organization staff	4
Students	4
Other	13
	100

EDRS Contract and Prices Change

The **ERIC** contract concerning the operation of the **ERIC** Document Reproduction Service (EDRS) has been awarded to LEASCO Information Products, Inc. As of March 21, 1971, the EDRS contract with the National Cash Register Company was terminated. Due to this change, a new order form, ordering information, and microfiche and hardcopy prices have been established.

New **ERIC** Reports prices are listed below:

MICROFICHE DUPLICATES

Request by Title, each title	— $0.65
Standing Orders, each fiche	— $0.089
Special Collections, each fiche	— $0.140
Back Collections, each fiche	— $0.089

HARDCOPY, Requests by Title

Pages 1 - 100	— $ 3.29
Pages 101 - 200	— $ 6.58
Pages 201 - 300	— $ 9.87
Pages 301 - 400	— $13.16
Pages 401 - 500	— $16.45

Each additional 1 - 100 page increment — $ 3.29

Book Rate or Library Rate postage is included in the above prices. The difference between Book Rate or Library Rate and first class or foreign postage (outside the continental United States) rate will be billed at cost. There will be no handling charges. All orders must be in writing and payment must accompany orders under $10.00.

The new **ERIC** Reports order form, as shown on Page 4, is available from:

ERIC Document Reproduction Service (EDRS)
P.O. Drawer O
Bethesda, Maryland 20014.

Prices and contract terms and conditions, which appear on the back of the order form, are on Page 5.

For further information, write:

J. Peter Maucher
Manager of Institutional Sales
OR
E. Brien Lewis
Manager of Client Services.
(Both are at the above mentioned EDRS address.)

All correspondence and orders for EDRS services should be sent to the permanent address given above.

AAS Collects Job Information for Ph.D.'s

The American Astronomical Society's executive office is the headquarters of a clearinghouse for job information primarily for new Ph.D.'s. This service, open only to AAS members, is not involved in the selection process.

Available university, government and industrial jobs are listed in a quarterly register. A second register lists those looking for jobs in astronomy, astrophysics, high-energy physics and radio astronomy.

For further information contact:

H. M. Gurin
Executive Officer
211 FitzRandolph Road
Princeton, New Jersey 08540.

Collections Available from EDRS

Leasco, Information Products, Inc. (LIPCO) has released the price schedule for **ERIC** special collections and the **Research in Education** back collections available from **ERIC** Document Reproduction Service (EDRS). Prices were determined by an actual inventory count of microfiche in each collection and represent the quantity of microfiche in each collection and the unit price applicable. New prices are as follows:

RIE BACK COLLECTIONS

NAME	*TOTAL FICHE*	*UNIT PRICE*	*COLLECTION PRICE*
Reports in Research in Education for 1966 & 67	4,426	$.089	$ 394.00
Reports in Research in Education for 1968	13,326	$.089	$1,187.00
Reports in Research in Education for 1969	15,899	$.089	$1,416.00
Reports in Research in Education for 1970	16,188	$.089	$1,441.00

SPECIAL COLLECTIONS

NAME	*TOTAL FICHE*	*UNIT PRICE*	*COLLECTION PRICE*
ERIC Catalog of Selected Documents on the Disadvantaged	2,740	$.14	$ 384.00
Office of Education Research Reports, 1956-65	3,315	$.14	$ 465.00
Selected Documents in Higher Education	1,258	$.14	$ 177.00
Pacesetters in Innovation, Fiscal Year 1966	1,185	$.14	$ 166.00
Pacesetters in Innovation, Fiscal Year 1967	1,437	$.14	$ 202.00
Pacesetters in Innovation, Fiscal Year 1968	919	$.14	$ 129.00
Manpower Research, Inventory for Fiscal Years 1966 & 67	653	$.14	$ 92.00
Manpower Research, Inventory for Fiscal Year 1968	364	$.14	$ 51.00
Manpower Research, Inventory for Fiscal Year 1969	473	$.14	$ 67.00

ERIC Document Reproduction Service

P. O. Drawer O, Bethesda, Maryland 20014

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1. Complete "bill to" and "ship to" addresses. Be sure to complete "ship to" address if different from "bill to". A like "ship to" address may be completed as "SAME". Include zip code.
2. Order document by printing ED number in designated space. ED accession numbers are listed in Research in Education (RIE). RIE may be purchased from: Superintendent of Documents, GPO, Washington, D.C. 20402.
3. Include number of copies (1, 2, 3, etc.) to be ordered in appropriate space. Use MF space for microfiche copies; use HC space for hard copy (Xerox). *Check RIE for availability of document in MF and HC.*
4. Include unit price from the rate schedule. (Refer to price schedule on back.) Prices published in RIE through April 1, 1971 are incorrect. Consult May 1971 and later issues for correct pricing.
5. Extend number of copies and unit price for total price for each title.
6. Add items 1 through 15 and insert amount in "Sub-Total" box.
7. Add state sales tax for Illinois and Maryland or check box and cite tax exemption number for Illinois and Maryland only.
8. Add "Sub-Total" and "Tax" and insert amount in "Total" box.
9. Indicate payment method desired. Payment must accompany all orders of $10.00 or less.
10. SIGN AUTHORIZATION and date order.
11. Include only 15 titles per form. Complete and sign additional forms if required.

Orders are filled only from ED accession numbers. Titles are not checked. *Please be sure you have supplied the correct numbers.*

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Pages:	1 - 100	3.29
	101 - 200	6.58
	201 - 300	9.87
	301 - 400	13.16
	401 - 500	16.45
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SMEAC
Science, Mathematics, and Environmental Education
Information Analysis Center
NEWSLETTER
AN ERIC CENTER

Center Comments

SEIAC → SMAC → SMEAC

To keep pace with expanding responsibilities, we have again changed our name. The Center originally processed documents only in the area of science education and our original name was Science Education Information Analysis Center (SEIAC). When responsibility for processing documents in mathematics education was added, we became the Science and Mathematics Information Analysis Center (SMAC). We are now designated as the processing center for documents related to environmental education as well. We are now known as the Science, Mathematics, and Environmental Education Information Analysis Center (SMEAC).

We feel that those areas we now encompass form a natural union and are mutually supportive. If readers of this newsletter would like to receive the Mathematics or Environmental Education Newsletters as well, they should return the coupon on page three.

Attention ERICTAPE Users

In response to the expressed needs of a number of users, we have recently:

ADDED A NEW DATA ELEMENT providing positive identification of documents which are **NOT** available from the ERIC Document Reproduction Service (EDRS).

REVISED EDRS PRICES on all records to date to conform to the current price schedule for both microfiche and hard copy.

Users have occasionally been inconvenienced when they have inadvertently ordered EDRS documents which are not available, due to copyright, legibility, etc. In order to minimize such occurrences we have taken two steps:

1. Each issue of **Research in Education** (RIE), beginning with January 1972, will contain at the back a list of documents **not** available from EDRS. Orders can be checked against this list prior to shipment to EDRS.
2. A fixed position on the magnetic tape record (Position 17) has had a special symbol (= = HEX7B) placed in it if the document is **not** available from EDRS. This position occurs at the end of the Sequence Code Field (Field ID HEX 0000), which contains the ERIC Accession Number. A document **not** available from EDRS will, therefore, have the following type of data in this field: ED123456=. An available document will lack the = symbol. Blanks or any other character in this position are not significant. All future updates will carry this indicator.

With the change in contractors for the EDRS, there was also a change in prices which applies to all microfiche and hard copy orders. However, these revised prices appear in the tape file only for documents announced in and subsequent to the May 1971 issue of **RIE**. The appearance of obsolete prices in current search results has created problems for both the users and EDRS. We have eliminated this problem by changing the EDRS price field (Field ID HEX 0025) on all records to date to conform to the current price schedule. The computation of the new price was based on pagination data contained in the record.

Completely revised cumulative master files incorporating both of these changes are available at standard prices*. Two (2) tapes are required for the full file at 1600 BPI and four (4) are required at 800 BPI. They may be ordered from:

ERICTAPES
LEASCO Systems & Research Corporation
4833 Rugby Avenue, Suite 303
Bethesda, Maryland 20014
(301) 656-9723

*OPTION 1 Files on LEASCO-supplied tapes @ $80.00 per tape. (LEASCO will provide files on high-quality, unused tapes with reduplication guarantee)

OPTION 2 Files on customer furnished, certified unused tapes @ $50.00 per tape. (LEASCO will duplicate files on customer supplied, certified previously unused tapes with limited reduplication guarantee)

Review of Research Completed

A review of research studies related to environmental education has recently been completed by Robert E. Roth and Stanley L. Helgeson of ERIC/SMEAC. Over 80 studies having relevance to environmental education were identified and reviewed. Most of the studies included were reported in the 1950—1970 decades. Many are oriented toward outdoor or conservation education and may be considered forerunners of environmental education as it is currently viewed.

The Review will be published by The Center for Science and Mathematics Education, The Ohio State University, Columbus, Ohio. After publication, the document will be announced in **Research in Education** (RIE) and in a future issue of this newsletter. Requests to purchase the Review will be accepted following the publication announcement.

SE 017 935

New Environmental Bibliography Issued

Publication of what is believed to be the most comprehensive reference work to date on books, journals, articles, and other literature dealing with the environment is announced by the Commission on Science Education of the American Association for the Advancement of Science. The 96-page compendium is entitled **Science for Society—A Bibliography**. Almost 4000 references, many annotated, are included. All aspects of the interrelations of man, society, environment, science, and technology are covered; titles are classified and indexed in major and minor categories to help the user find materials on specific subjects.

The bibliography is a second and much expanded edition of a publication bearing the same title and issued a year ago. Dr. John A. Moore, Professor of Biology, University of California, Riverside, and Chairman of the Commission, has again served as editor of the new edition.

Support furnished by the National Science Foundation, E. I. du Pont de Nemours & Company, Xerox Corporation, and the AAAS itself makes it possible to offer the bibliography at the price of $1.00 per copy, or 75c each for ten or more copies. Orders, accompanied by payment, should be addressed to:

Education Department, AAAS
1515 Massachusetts Avenue, N.W.
Washington, D.C. 20005

Directory of Speakers on Drug Abuse Published

Drug Abuse Prevention: A Guide to Speakers—a listing of agencies throughout the country that provide speakers on the subject of drug abuse—has been published by the National Clearinghouse for Drug Abuse Information.

The Clearinghouse, located at the National Institute of Mental Health, acts as the focal point for drug abuse information collection and dissemination for the entire Federal Government. The National Institute of Mental Health is a component of HEW's Health Services and Mental Health Administration.

In announcing the availability of the **Guide**, Gerald N. Kurtz, Director of the National Clearinghouse for Drug Abuse Information, said "Most programs on drug abuse should include a professional working in drug abuse, or another person who has experience or is knowledgeable in this field, to provide accurate answers to the many questions which inevitably are asked by an audience. The **Guide** will help anyone needing a speaker to obtain an appropriate one from among the speaker's bureaus in his area."

The **Guide** provides information by State on each agency or program operating a speaker's bureau, including the name of the director, address, and telephone number.

Each program listed in the **Guide** reported having an active speaker's bureau when asked to describe its services and functions for the Clearinghouse's National Inventory of Drug Abuse Programs. The inventory is part of a comprehensive computerized information-retrieval system covering the field of drug abuse.

Individuals wanting a copy of the **Guide**, as well as persons with information about additional programs, should contact:

National Clearinghouse for Drug Abuse Information
Program Information Services
Department MEK, Room 8C-09
5600 Fishers Lane
Rockville, Maryland 20852

Information received will be used to update the **Guide** and will be included in the Clearinghouse computer system.

NSTA Annual National Convention to be in New York City

The 20th National Science Teachers Association Annual National Convention will be held in New York City, April 7-11, 1972. The program will include seminars, major addresses, panels, symposia, rap sessions, workshops for teachers, awards and citations, special sessions, and tours and visits. Particular daily sessions and activities that will be carried out in tune with the theme "Alternatives in Science! or Alternatives to Science?" will be in brief:

Friday, April 7
- Section meetings
- Opening of Exposition of Science Teaching Materials
- Scientific Tours and Visits
- Annual Open Session of Federation for Unified Science Education (FUSE)
- Commercially Sponsored Workshops
- Annual Welcome Dance and Mixer

Saturday, April 8
- Commercially Sponsored Workshops
- NSTA General Session I, Damon Lecture
- CESI-NSTA Elementary Science Luncheon
- NSTA-Sunoco Science Seminars
- NSTA Concurrent Sessions
- NSTA General Session II, and Presentation of awards

Sunday, April 9
- Annual Life Members' Breakfast
- Natl. Assoc. for Industry-Education Cooperation Annual Meeting
- NSTA Concurrent Sessions
- NSTA-Sunoco Science Seminars
- NSTA Members' Contributed Papers
- NSTA Annual Banquet and Presentation of Distinguished Service Citations

Monday, April 10
- Commercially Sponsored Workshops
- NSTA Members' Contributed Papers
- NSTA Concurrent Sessions
- NSTA-Sunoco Science Seminars
- NSTA General Session III

Tuesday, April 11
- Scientific Tours and Visits

For registration information, write to NSTA headquarters. Persons who wish to volunteer for participation roles should write to:

Mr. Fred Blumenfeld
1972 Program Committee Chairman
c/o NSTA Headquarters
1201 Sixteenth Street, N.W.
Washington, D.C. 20036

The Micro-Library Series

A major objective of the ERIC program is to make current educational information directly available to those who most need it. As a step toward achieving this objective, CCM Information Corporation has packaged ERIC information using the "micro-library" concept.

A Micro-Library is composed of a printed index and microfiche copies of ERIC titles in a particular subject area. Currently in preparation are Micro-Libraries of materials on topics relating to **Library/Information Sciences** and **Social Science/Social Studies**. The **Reading Micro-Library** is available now at $395.00.

The Micro-Library is unique in that materials processed into ERIC are frequently not widely known nor readily available through the major publishing channels. Such items as speeches, conference proceedings, and federally-funded research reports are included. Approximately 1000 titles will be available in each Micro-Library, and will include selected materials processed by the ERIC network since its inception, plus other pertinent titles added to the ERIC collection from 1966 through 1971 and announced in **Research in Education.**

Citations and abstracts are also obtained from **Selected Documents on the Disadvantaged** and **Office of Education Research Reports,** 1956-65. Journal Articles which were indexed for **Current Index to Journals in Education** 1969, 1970, and 1971 are also included. All of this material is organized into four sections: Subject Index, Author Index, ERIC Documents, and ERIC Journal Articles. Each microfiche collection will be arranged in numerical sequence in an attractive, functional case.

Additional information about the Micro-Library Series can be obtained from:

CCM Information Corporation
866 Third Avenue
New York, New York 10022

Guide to ERIC Available

A twenty-page guide entitled **"ERIC: How To Use It For Science Education"** has been developed by and is available from ERIC/SMEAC. The guide presents a summary of pertinent information concerning the ERIC system, with emphasis on science education functions and is directed primarily to those individuals needing a ready digest of ERIC services and procedures.

Single copies are available at no cost from ERIC/SMEAC. Similar documents are available through ERIC/SMEAC for environmental education and for mathematics education.

Unified Science Bibliography Being Compiled

The Federation for Unified Science (FUSE) is in the process of identifying and collecting unified science publications in an attempt to provide a comprehensive bibliography. Documents cited in the preliminary bibliography are included in the ERIC system and are available through EDRS.

Persons interested in obtaining a copy of the bibliography or who have identified publications to be included should write to:

Dr. Barbara Thomson
College of Education
1945 North High Street
The Ohio State University
Columbus, Ohio 43210

The ERIC Information Analysis Center for Science, Mathematics, and Environmental Education produces separate newsletters for three interest groups. If you would like to receive our other newsletters, please complete and return this coupon.

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   Title _____

Clip and mail to: ERIC Information Analysis Center for
Science, Mathematics, and Environmental Education
1460 West Lane Avenue
Columbus, Ohio 43210

NSTA Facilities Report Available

A study of school science facilities completed by a six-member team representing the National Science Teachers Association has resulted in the identification of some exemplary facilities for secondary school science. The committee's report is in the form of an informative filmstrip with cassette-tape report. Entitled "Evolving Patterns for School Science Facilities," the filmstrip is comprised of highlights from the nationwide study and includes scenes from selected facilities visited during the study. The kit (filmstrip, cassette-tape and printed script) may be purchased for $7.50 from:

National Science Teachers Association
1201 16th Street, N.W.
Washington, D.C. 20036

This report should aid science teachers seeking better use of school space, as well as being a presentation of exciting alternatives for architects, teachers or administrators who are planning new or remodeled facilities. The commentary on curriculum, staffing, programming and materials preparation is an invaluable source for methods course instructors and for workshop groups.

An illustrated, hard-cover book reporting in detail on the facilities study has been in preparation, with publication expected in March, 1972. Advance orders may be placed with the National Science Teachers Association.

Teachers Group Calls for Scientific Literacy

The nation's science teachers are proclaiming scientific literacy as the goal of their efforts for the 1970s. If they achieve this goal, the schools will be turning out people who are comfortable in science, understand its limitations and possibilities, can use it skillfully and intelligently, and will continue its development. In other words the science teachers are aiming at a facility in science comparable to what many now have in literature, economics, or the arts, for example.

This goal was set forth by the National Science Teachers Association in a position paper published in its official organ, THE SCIENCE TEACHER, November 1971 issue. "School Science Education for the 70s" is the Association's first major statement on curriculum goals and philosophy since 1962 when the NSTA urged the use of the great conceptual schemes of science as the framework for the development of science content and processes.

The present document calls for attention also to the social aspects of science and technology and the values deriving from science. "Scientifically literate persons," it says, "will use the achievements of science and technology for the benefit of mankind . . . Emphasis on values and on the social aspects of science and technology must be integral parts of any science curriculum."

The document spells out the characteristics of a scientifically literate person and recommends Association action to implement the proposals in the statement. The NSTA is the largest organization dedicated to science education at elementary, secondary and collegiate levels. Single copies of the document may be obtained free from:

NATIONAL SCIENCE TEACHERS ASSOCIATION
1201 Sixteenth Street, N.W.
Washington, D.C. 20036

NSTA Introduces New Titles in '72

Four new titles expand the selection in the National Science Teachers Association How-To-Do-It Series. **How to Present Audible Multi-Imagery in Environmental Ecological Education** by Pascal Trohanis, **How to Read the Natural Landscape in Forests and Fields** by Millard C. Davis, **How to Handle Radioisotopes Safely** by John W. Sulcoski and Grafton D. Chase, and **How to Study the Earth from Space** by Robert E. Boyer offer procedural approaches to lecture, laboratory, and outdoor environmental exploration techniques. Teachers will benefit from the previously established streamlined format which promotes rapid incorporation of the material into busy schedules.

Copies may be ordered directly from the:

National Science Teachers Association
1201 Sixteenth Street, NW
Washington, D.C. 20036

How to Present Audible Multi-Imagery in Environmental Ecological Education (8 pp., 471-14614; 50c).
How to Read the Natural Landscape in Forests and Fields (12 pp.; 471-14618; 50c).
How to Handle Radioisotopes Safely (12 pp.; 471-14616; $1).
How to Study the Earth from Space (12 pp.; 471-14624; 50c).

Discounts: 2-9 copies, 10 percent; 10 or more copies, 20 percent. Payment must accompany all orders except those on official order forms. Postage and handling charges will be added to billed orders.

Biological Specialty Teaching Materials

Teaching materials for BIOTECHNICIANS will be developed for the American Institute of Biological Sciences Project BIOTECH during 1972-73, with emphasis to be placed on the following topic areas:

Analytical biology techniques
e.g. Determining feed efficiency
Animal techniques
e.g. Handling rodents
Botanical techniques
e.g. How to transplant from flats to field plots
Microbial culture methods
e.g. How to isolate a single cell
Microscopy technique
e.g. Making frozen sections
Preparative and basic skills
e.g. Calculate/prepare normal solutions
Preservation methods
e.g. Herbarium specimen preparation
Sterilizing
e.g. Use of chemical for . . .

Confined to single-task units called BIOTECH Teaching Modules, the factual data are being solicited from technicians and technologists experienced in these fields. Further information and a list of specific topics for which data are being sought may be obtained from:

John H. Busser
Director, Project BIOTECH
3900 Wisconsin Avenue, N.W.
Washington, D.C. 20016

COPES Grade Two Materials Now Available

COPES (Conceptually Oriented Program in Elementary Science) is one of the 1970's K-6 science curriculum projects in which activities are designed to develop concepts and relate them to five major conceptual schemes so that children obtain a truly integrated view of science.

The Teacher's Guide for grade 2 is now available and includes lists of readily available equipment and materials used in all activities as well as assessment materials. The assessment materials are designed to evaluate group achievement as well as provide additional teaching materials for those children who need more experience. The K-2 Guides serve as the foundation for the sequential development of the total COPES curriculum. These Guides can be used to introduce any good elementary science program because of the basic nature of the teaching materials.

The Grade 2 sequence of activities consists of "Wholes, Parts, and Patterns;" "Measurements, Changes, and Patterns;" and "Patterns and Predicting."

Other COPES materials which are available include a Grade 2 assessment kit, a K-6 Teacher's Guide for a Conservation of Energy Sequence (developed during COPES Pilot study), Teacher's Guide for the K-1 sequence, an assessment kit for K-1, and Water-Mix Experiments (a single-concept booklet consisting of 15 teaching activities usable above grade 3). The Water-Mix Experiments booklet and accompanying equipment kit are available from:

American Science and Engineering
20 Overland St.
Boston, Mass. 02215

COPES materials and more information may be secured by writing to:

Center for Field Research and School Services
New York University
51 Press Building
Washington Square
New York, New York 10003

Health Education Consortium Formed

At least twenty-nine state educational or broadcasting agencies, one agency representing a Canadian province, and at least three representing metropolitan areas are planning to join forces in the health education consortium recently announced by National Instructional Television (NIT). Out of the project will come a television series designed to help eight-to-ten year-olds understand and cope with the social, emotional, and physical problems they will face as they grow to adulthood.

The participation of thirty-three or more agencies in the $600,000 undertaking makes it NIT's largest project to date—and the most extensive in the history of school television.

Production of the thirty 15-minute programs began in January, 1971. The first programs will be released in January, 1973, and the entire series in September of that year.

Programs in the series are to be produced by four or five different agencies, under the supervision of NIT and the consortium's national and regional consultants.

The consortium participants will contribute some $450,000 to the project—or about three-fourths of the amount required to produce the series. In NIT's first consortium effort, thirteen participating agencies provided $179,000 of the $260,000 needed to develop the early childhood series "Ripples." In the second consortium venture, twenty-six agencies provided $288,000 of the slightly more than $400,000 required for the art series "Images & Things."

"Images & Things" Ready for Distribution

Production is completed for "Images & Things," an NIT series focusing on what the representation of man in art reveals about social concepts and attitudes in various cultures.

Thirty programs make up the art education series for ten-to-thirteen-year-olds. The first sixteen were released in September to the twenty-six consortium members and a long list of other users.

The Kentucky Authority for Educational Television in Lexington produced three programs this past fall—"Remembering Happy Times," "Birds, Bees, and Bugs," and "Getting the Message." KETC-TV, St. Louis, is producing "Wrappings and Trappings," "Man: Friend and Enemy of Nature," "Street Furniture," and "Land Images."

The other seven programs came from the Northern Virginia Educational Television Association in Annandale. They are: "Groups of People," "Stars and Heroes," "Pageants, Parades, and Festivals," "Faces of Nature," "Buildings for Work and Play," "All Kinds of Houses," and "Spaces to Live In."

"Images & Things" doesn't stop with television programs. Further opportunities to enjoy and understand art will be available to classrooms through two learning resource kits. The basic kit contains 180 slides of art works, ten hand viewers, and a booklet. The enrichment kit has, in addition to these, ten reproductions, a camera with film, and a phonograph record. Both kits were developed under the direction of Jerry Tollifson, consultant for classroom utilization.

During the time that "Images & Things" was in production, Dr. Alice M. Schwartz was on leave from The Pennsylvania State University, where she is professor of art education, to serve full-time as content designer for the series. Dr. Schwartz was also in charge of writing the "Images & Things" teacher's guide.

Dr. John W. Cataldo, professor of art and dean of The Massachusetts College of Art, also has served as a content designer. Dr. Edmund B. Feldman, professor of art at the University of Georgia, has been a special consultant, and Jerry Tollifson, supervisor of art education in the Ohio Department of Education was supervisor for classroom utilization.

SMEAC Science, Mathematics, and Environmental Education Information Analysis Center
NEWSLETTER
AN ERIC CENTER
Science Education — Volume 4, Number 2, 1971-72

National Assessment Science Findings Offer Challenge

Information presented to the Steering Committee of the Education Commission of the States by members of the National Assessment of Educational Progress project indicate that (1) if a young American student's parents did not have the advantage of much education, (2) if the student lives in the inner city, (3) if the student is black, the student knows less about science than does the nation as a whole.

The third and newest science report is broken down into three main areas: color, level of parental education, and size and type of community. This is the first of the series of reports in which data were provided relative to specific types of communities.

Dr. J. Stanley Ahmann, staff director of National Assessment, said, "Educators have suspected over the years that the performances of young people in the affluent suburbs were higher than that of youngsters living in the inner city but concrete evidence did not exist. Likewise, we have never before had valid data on a national basis to demonstrate the relationship of parental education to the achievements of children.

"This is why this report is so significant to the nation. It is giving us information which never existed in terms of the real world of achievement by young people. It gives the nation some necessary benchmarks which are essential to judge future educational progress."

Influence of Parental Education

National Assessment science results showed that youngsters whose parents had no more than an eighth grade education performed from 7% to 12% below the national level in knowledge of science while those with at least one parent educated beyond high school ranked from 5% to 9% above the national average.

Young people with at least one parent who attended high school were from 2% to 8% below the national level, those with at least one parent who was graduated from high school ranked from 1% below to 3% above the median, and those with parental education unknown were from 4.6% to 16.8% below the national level.

However, effects that are apparently related to parental education in some cases may be more simply explained by differences in size and type of community or differences in color that are masquerading as differences in education, National Assessment officials pointed out.

Generally, those individuals with neither parent completing high school had the most trouble with exercises requiring special vocabulary knowledge or scientific reasoning from graphs and pictures.

Adults whose parents had not attended high school scored 17% to 18% below the national average on a number of exercises. At the other end of the scale, young people with at least one parent educated beyond high school did especially well on exercises that required an understanding of the scientific method. Youngsters who had at least one parent who had completed high school were very close to the national average on virtually all of the assessment exercises.

At each age assessed there was virtually no difference in performance on physical and biological science exercises, with these exceptions: at age 9 and age 17, youngsters whose parents had no more than an eighth grade education did a little better on physical science exercises than on biological; adults whose parents had post high school education did a little better on biological science exercises than on physical science. The report does not offer any explanation for these differences in performance.

Suburban vs. Inner City Results

The performance of the respondents in National Assessment can reflect individual, school or environmental factors. When any one set of results is inspected, the fact must be recognized that a number of factors may be influencing these results.

The National Assessment results reflect the changing status of American communities— the flight to the suburbs of many better educated families of the middle and upper classes.

In the extreme inner city the nine year olds scored very low on those aspects of science where everyday experiences could be expected to provide the child with the correct answers. For example, the inner city nine year olds scored low on an exercise for which they had to know that iron does not burn readily (28% below the national average); a bee gets his food from flowers (22.5% below); pine trees stay green all winter (23% below).

Young adults in the inner city were low on exercises which involved the use of some scientific apparatus. For example, they were 48.2% below the national level in an exercise which involved timing the swing of a pendulum with a stop watch.

Young people in extreme rural areas did best at all age levels on those exercises which they could answer with information gained in their general living experience, e.g. the importance of green plants or the effects of heating water in containers of varying shapes. They did poorly on exercises that demanded graph reading or required a considerable scientific vocabulary and detailed formal knowledge.

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Rural young adults were 30% below the national level on an exercise that required them to know that Darwin proposed the theory of evolution.

Youths from extreme affluent suburbs did their best work on questions that involved relatively abstract principles and ideas or the kind of knowledge usually acquired in the classroom.

In all seven types of communities, the young people did about as well on the physical science exercises as on those involving biological science. Here again the extreme inner city population fell well below the national average in all four age levels (9, 13, 17 year olds and young adult, 26-35).

Three inner city age groups showed somewhat less knowledge of biological than physical science. The fourth, the age 17 group, was —8.5% below the national level in knowledge of physical science, only —5.3% in understanding of biological science.

The 17 year olds in extreme rural areas performed better on physical science (—3.1%) than on biological science (—6.8%).

Performance of Blacks

The results showed Blacks performed 12% to 16% below the national average at all four age levels assessed (9, 13, 17 year olds and young adults, 26-35). On the whole, Blacks performed best on those science exercises most dependent upon daily experience and common knowledge and poorly on those which involve the more abstract aspects of science.

National Assessment officials pointed out that assessment does not measure I.Q. ratings or the effects of heredity, genes or other factors which are the handles for many of the sociological discussions being carried on today. However, the performance of Blacks may well reflect individual, school or environmental factors which influenced the results, up or down. There is no sure way to determine or identify all the complex factors which influence the Black educational condition in America today.

The results for Blacks and Non-Blacks differed widely from exercise to exercise, but there was no systematic decline in Black performance with increasing age. While all four age groups of Blacks fell below the national level, the percentages for all of the exercises differed, with the age 17 Blacks showing the least loss. The deficits were: 14.5% for age 9, 15.0% for age 13, 11.8% for age 17, and 15.8% for young adults.

There were a few exercises on which Blacks did better than the national average. The best such performance was by Black 17 year olds who did 17.9% better than the national average on an exercise which asked respondents to select one of four graphs to complete a question on a physical equation.

On some questions Black performance was virtually equal to the national average. The lowest performance on an exercise was by Black adults who scored 41.7% below the national average on a question involving the graphing of laboratory data.

There was not a great deal of difference in the performance of Blacks in exercises relating to physical and biological sciences though performance on the latter was slightly better.

National Assessment personnel observed that it is not possible to draw conclusions about the many conceivable sets of factors that explain Black performance at the four age levels. A number of additional research efforts over a period of years will be needed to resolve these questions.

Reports and Publications Available

A limited number of advance copies of Science Report 7 are available on single-copy request from the ECS office in Denver. Copies of Report 7 will be available in approximately two months from:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

Checks or money orders should be made out to the Superintendent of Documents.

Reprinted articles are available at no charge from:

National Assessment Publications
300 Lincoln Tower
1860 Lincoln Street
Denver, Colorado 80203

A listing of all publications available from National Assessment will be sent free of charge upon request.

Future Assessment Results To Be Reported by Themes

The first Reading Assessment Report will introduce a new way of presenting NAEP results. For the assessments of Science, Writing and Citizenship, reporting has been on a "phase format." That is, the first report for each subject area gave national results for all released exercises. Later reports gave results by region, sex and size of community and by color, parental education and type of community.

The NAEP directors have agreed to replace this method of reporting with a "theme format." Under this plan the results for each subject area would be published in a number of volumes, each presenting exercises centering on a content theme. Each of these volumes would give national results and the breakdowns by region, sex, color, parental education and size and type of community for the exercises it covers.

Each year a general volume (the first to be: Year 02 Assessment—General Information) will be published which will serve as an introduction to all data volumes for all subject areas reported that year. It will contain two major sections: a non-technical section aimed at all readers and a technical section aimed at the statistically sophisticated. This volume will not report specific results but will describe assessment methods, populations and other general information.

The themes under which reading exercises have been grouped were developed by the National Assessment staff and two consultants in the field of reading, Alton Raygor, coordinator of the Reading and Study Skills Center at the University of Minnesota, and George Spache, past president of the International Reading Association and the National Reading Conference.

These experts have chosen nine separate themes:

Understanding Word Meanings
Reading and Visual Aids
Following Written Directions
Reading and Reference Materials
Reading for Significant Facts
Reading for Main Ideas and Organization
Reading and Drawing Inferences
Critical Reading
Reading Rate and Skimming and Scanning

A summary volume and one or more of these theme volumes will be released in March. The reports on Reading Rate and Skimming and Scanning and perhaps one or more other themes will be released in early May and later presented at the International Reading Association Convention.

Reporting on the Reading Assessment is expected to be completed by June.

Availability of PREP Reports Increased

PREP (Putting Research into Educational Practice) is a series of monthly reports which synthesize and interpret research, development, and current best practice on specific educational topics. Intended as a format for disseminating significant findings to the practitioner quickly, these reports are targeted to specific educational audiences—the administrator, school board member, teacher, curriculum specialist, and teacher educator.

PREP reports have been issued on the following topics:

1. Instructional Television Facilities: A Guide for School Administrators and Board Members
2. Reading Difficulties: Reading and the Home Environment. The Principal's Responsibility
3. Establishing Central Reading Clinics: The Administrator's Role
4. Correcting Reading Problems in the Classroom
5. Treating Reading Disabilities: The Specialist's Role
6. Bilingual Education
7. School-Community Relations: Research for School Board Members
8. Teacher Militancy, Negotiations, and Strikes: Research for School Board Members
9. Job-Oriented Education Programs for the Disadvantaged
10. Seminar on Preparing the Disadvantaged for Jobs: A Planning Handbook
11. Research on Elementary Mathematics
12. Paraprofessional Aides
13. Sharing Educational Services
14. Social Studies and the Disadvantaged
15. Student Participation in Academic Governance
16. Individualized Instruction
17. Microteaching
18. Reinforcing Productive Classroom Behavior: A Teacher's Guide to Behavior Modification
19. Migrant Education
20. Teacher Recruitment and Selection
21. Teacher Evaluation
22. A Readiness Test for Disadvantaged Preschool Children
23. Educational Cooperatives
24. School-Community Relations and Educational Change

Copies of PREP reports may be purchased at the following prices:

Single copy—55 cents
100 or more copies mailed to the same address—25% discount
Yearly subscription (12 reports)—$6.00
Add 25% to the above prices for foreign mailing

Order from:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

Review of Environmental Education Programs and Materials

A project funded by the U.S. Office of Education to review programs and materials related to environmental education has recently been completed. The project, directed by Dr. Stanley L. Helgeson and Dr. Nicholas Helburn, was a cooperative effort involving personnel from the ERIC Clearinghouse on Science, Mathematics, and Environmental Education (SMEAC) at The Ohio State University, Columbus, Ohio, the ERIC Clearinghouse on Social Studies/Social Science (CHESS) and the Social Science Education Consortium (SSEC) at the University of Colorado, Boulder, Colorado.

The project produced Targeted Communications reports intended for three audiences: elementary and secondary school teachers, teachers of urban/disadvantaged, and school administrators. The reports each contain a discussion which provides the reader with an orientation to the problems associated with environmental education, a brief description of the problems and needs identified for the target audiences, and a summarization of research related to these needs and problems. Current practices concerning environmental education programs and materials are summarized and recommendations are made for developing and implementing programs and materials. Brief descriptions of selected programs and materials are included as well as case studies describing environmental education program development and implementation.

The three reports will soon be available from the ERIC Document Reproduction Service, with ED numbers announced in a future issue of this newsletter. In addition, the reports will be summarized and disseminated in the form of a PREP report by the U.S. Office of Education.

New NIT Series Being Produced

One good series calls for another. And so, next fall, will come "Animals & Such," a life science course for eight-to-ten-year-olds now in production at Hampton Roads Educational Television in Norfolk, Virginia.

The new NIT series—fifteen 16-minute programs in color—is being produced by the agency that developed the prize-winning "Community of Living Things," a series for junior high school students that was released last fall by NIT. It also has the same television teacher, Larry Crum, and the same imaginative photographer, Stewart Harris.

Like "Community of Living Things," "Animals & Such" scrutinizes life in various forms at extraordinarily close range and studies the relationships between organisms and their immediate environment.

The approach developed in both series stresses living specimens and advanced photographic techniques. The Hampton Roads production team has steadily experimented with different kinds of magnifying instruments, camera placements and angles, time lapse procedures, and even polarized light, which can bring out colors not available to the naked eye.

Programs already filmed for "Animals & Such" include one about the practice of bird-banding as it is carried out at Fisherman's Island in the Chesapeake Bay and another about life on a rotting log, featuring slime moulds and termites and other good things. Later programs will focus on reptiles and scaly animals, amphibians, feathered creatures, octopi, sea slugs and urchins, star fish, and other unusual organisms.

"Animals & Such" will be ready for distribution in September of 1972.

Health Design Team Drawing Up Goals, Program Outlines

The curriculum design team for National Instructional Television's health education project is drawing up specific objectives and program outlines for each of the thirty 15-minute programs in the projected series.

The curriculum designers began with the basic approaches to health education developed during the past year by the project's national planning committee. They are converting action concepts devised by the planning group—using, growing, loving, hurting, enjoying, fearing, and hating—into working models upon which the programs will be based.

The curriculum design team is chaired by chief national consultant for the project, Dr. Orvis A. Harrelson, director of health services for the Tacoma, Washington, public schools.

Other members of the team are Dr. Jerry Brown, associate director, Laboratory for Education Development, Indiana University; Dr. Glenn Easley, clinical psychologist, Tacoma, Washington; Dr. Jimmy Phelps, assistant superintendent for curriculum, Santee (California) schools; and Dr. Wallace Ann Wesley, assistant director, Department of Health Education, American Medical Association. NIT's representative is Larry Walcoff, executive producer of the series.

The national planning committee consists of Dr. Robert S. Cobb of Mankato (Minnesota) State College; Miss Pat Hill, consultant on health education to the California State Department of Education; Mrs. Margaret Kerr, a high school teacher in Nashville, Tennessee; Dr. Edward Mileff of Indiana University of Pennsylvania; and Dr. Wesley. Dr. John Cooper of the American Association of Health, Physical Education, and Recreation is a special consultant.

NARST Annual Meeting Held

The 45th annual meeting of the National Association for Research in Science Teaching (NARST) was held in Chicago, Illinois, April 4-6, 1972.

Science educators from throughout the nation assembled to hear and discuss research reports dealing with such topics as evaluation, test and instrument development, student achievement, teacher preparation, and learning theory.

Informal seminars led by outstanding science educators were held to provide members with an opportunity to discuss issues related to evaluation, research design, learning theories, and new trends and directions in science education. Special discussion sessions centered around research papers made available in advance and featured an hour with each of the authors in considering the results and implications of the investigations. Special symposia focused on concerns related to environmental education and problems of beginning teachers.

Feature addresses presented to general sessions were:

"The Emperor's Clothes Phenomena In Science Research" by Dr. James D. Raths, University of Maryland.
"A Darwinian Look at Science Education" by Dr. Frank X. Sutman, NARST President, Temple University.
"Can Research Find a Rationale for Science Education Research" by Dr. Harry Broudy, University of Illinois.

Can Science Teaching As We Know It Today Survive?

What will school science instruction five, ten years hence be like? Will compartmentalized courses labeled physics, chemistry, or biology go down the drain in favor of interdisciplinary combinations or other approaches? How will science teaching be made relevant to social problems, such as population, energy needs, environment?

These questions and many similar ones were discussed and debated April 7-11 in New York City when 7,000 of the nation's science teachers met in the 20th annual convention of the National Science Teachers Association. The convention theme was "Alternatives *in* Science! or, Alternatives *to* Science?"

Keynoting the convention, Philip Morrison, Professor of Physics at the Massachusetts Institute of Technology, called on a theme from Galileo, "What the Cicada Sang," to discuss scientific investigations appropriate to modern science education.

Barry Commoner, outspoken fighter for environmental matters and director of the Center for the Biology of Natural Systems at Washington University, St. Louis, carried the theme into "Science and Social Action" at the banquet session.

"Science and the Open Society" was the topic of John Bremer, Academic Dean, Newton College of the Sacred Heart, Newton, Massachusetts. Richard A. Goldsby, Associate Professor of Biology, Yale University addressed the convention on "The Biology of Race and Races" with emphasis on the significance of racial differences for the conduct of human affairs.

At 54 concurrent sessions and panels, geared to all levels of education from kindergarten through college, convention participants ranged over topics as varied as drug education, the pupil centered classroom, scientific literacy, open enrollment for colleges, and social responsibility and technology. At contributed papers sessions, more than 100 teachers themselves reported innovations already under way, presented ideas for other alternatives to the traditional school and subject organization, and caught up with trends in the field.

"Hands-on" time for new instructional materials was offered by a series of commercially sponsored workshops. Here teachers actually worked through the activities like students in a classroom. The exposition halls of the Americana and New York Hilton hotels were filled with commercial and noncommercial displays of teaching aids, textbooks, equipment, laboratory furniture, and curriculum materials designed to support the new techniques coming into use in classroom and laboratory as well as to provide subject matter for alternatives in science education.

NSTA Convention Tapes Available

Tapes of four major 1972 NSTA Convention speeches by Philip Morrison, John Bremer, Richard Goldsby, and Barry Commoner are available individually or as a series. Current Information Associates, Inc., of Hyattsville, Maryland, is making the INFORM series of tapes available for $5 each or $19 for the group.

Tapes may be ordered from:

Current Information Associates, Inc.
Box 23
Hyattsville, Maryland 20781

(make checks payable to the company).

Undergraduate Program Receives National Award

At the 1972 meeting of the American Association of Colleges for Teacher Education, held in Chicago, March, 1972, the undergraduate program in science and mathematics education at The Ohio State University received a Distinguished Teaching award.

This program, which involves cooperative efforts with the Faculties of Curriculum and Foundations and of Educational Psychology and the Columbus, Ohio, Public Schools, enables undergraduates to work in the schools during the junior and senior years. In the junior year, students spend two half-days per week in the schools each of three quarters, working in a tutorial situation involving ninth grade science, teaching science to elementary school children, and guiding laboratory lessons in senior high school. In the senior year, students combine the acquisition of special methods for teaching their particular discipline with work in schools of two different socioeconomic types, spending five mornings a week in the schools. The program culminates with a full-time student teaching assignment in one school for the final quarter of the student's work in science or mathematics education.

UNESCO's Copyright Information Center

Operations have begun at UNESCO's International Copyright Information Center, established to help ease problems faced by publishers in developing countries in securing rights to books published elsewhere. The International Copyright Information Center will try to make it easier to obtain rights to such books in order to meet domestic needs.

The Center collects copyright information on books that can be made available to developing countries on terms as favorable to them as possible. It also arranges for the transfer to developing countries of rights ceded by copyright holders. In the course of its work, the Center will help in the development of simple model forms of contracts for rights required by developing countries and study solutions to foreign currency shortages affecting such rights. The Copyright Information Center will also promote arrangements for the adaptation and publication of works, particularly those of a technical and educational character.

Particular attention has been called to the need for the production of scientific and technical books, whose importance for economic development is obvious. The shortage of such books is particularly acute and plans for expansion of national publishing industries are being considered. Initial emphasis will be placed on scientific and technical books as well as on educational publications in general.

ECOLOGY FORUM OFFERS DISCOUNTS TO PEMAP PARTICIPANTS

Ecology Forum, Inc., of New York City has announced that schools participating in the Environmental Protection Agency President's Environmental Merit Awards Program (PEMAP) are eligible for significant discounts on two publications of use as environmental references, both for student projects and for general use in classroom and library.

The publications are **Environment Information Access**, having a regular price of $150 per year's subscription, and **Environment Index**, normally priced at $75. Only one copy of the **Index**, and one subscription to **Access** are available per school at discount.

Access, published twice monthly, serves as an abstract journal, an environmental index, and a library system. Covering 21 major areas of environmental affairs, it searches 1000 periodicals, reports, documents, and books. Each issue contains 300-400 citations.

Environment Index, a desk-library reference, is an annual 600-page summary containing 42,000 citations, in addition to patent coverage, legislative highlights, and other pertinent information.

Further information concerning the discounts is available to PEMAP project directors, upon school enrollment in the program. Approximately 2,000 schools are currently eligible. Schools interested should contact:

Arthur W. Peters, National Coordinator
President's Environmental Merit Awards Program
U.S. Environmental Protection Agency
Washington, D.C. 20460

ERIC/SMEAC, USOE (EE) Develop Cooperative Model

Development of a cooperative model "for communication and functional task accomplishment by which ERIC/SMEAC and the U.S. Office of Environmental Education can each better achieve their respective objectives" is the aim of a project recently instituted by the two agencies.

The project was undertaken as representatives of the two organizations found that duplication of effort with attendant increased cost, as well as some gaps in information obtained, was limiting the effectiveness of each agency, and therefore the total environmental education efforts. Tasks in which both agencies have need for environmental education information have been identified to include:

1. Identification of information, programs, and/or projects dealing broadly with environmental education;
2. acquisition of materials and descriptive documents for further dissemination, analysis, and reporting;
3. preparation of bulletins, newsletters, targeted documents, and information network reports for practitioners in the field, special audiences, and state environmental education supervisors;
4. dissemination of such products and of other materials to educators, administrators, and related practitioners and researchers in environmental education;
5. maintenance of complete, up-to-date "state books" as records of programs, projects, organizations, and personnel actively involved in environmental education.

Projects currently underway include cooperation in procurement and preparation of material for this and subsequent editions of the **Environmental Education Newsletter**, updating and further development of the "state books" mentioned above, institution of compatible filing and retrieval systems between the two offices, and cooperation on a number of additional projects.

Under terms of the agreement, a cooperative mode of operation has been designed such that three and one-half full time employees physically located at USOE (EE), Washington, function under the leadership of ERIC/SMEAC. Task assignments are coordinated by **Dr. Robert E. Roth**, Associate Director for Environmental Education, ERIC/SMEAC, and **Dr. Robert Gilkey**, Director of USOE (EE).

SMEAC Science, Mathematics, and Environmental Education Information Analysis Center
NEWSLETTER
AN ERIC CENTER

Compilation of NARST Abstracts Announced

In a cooperative effort, ERIC SMEAC and NARST have compiled abstracts of most of the papers presented at the 45th annual meeting of the National Association for Research in Science Teaching (NARST) held in Chicago, Illinois, April 4-6, 1972. The compilation includes abstracts of over 85 research studies and symposia. Many of the presented papers will be published in journals or made available through the ERIC system. These will be announced through Research in Education (RIE), Current Index to Journals in Education (CIJE), and other publications of the ERIC system.

Copies of the compilation of abstracts of presented papers may be obtained from:

ERIC Document Reproduction Service
P.O. Drawer 0
Bethesda, Maryland 20014

Ordering information:

National Association for Research in Science Teaching, 45th Annual Meeting, Abstracts of Presented Papers.

ED 059 918 MF $0.65 HC $5.28

AAAS Guidelines for Preservice Education

A new set of **Guidelines and Standards for the Education of Secondary School Teachers of Science and Mathematics** has been published by the Commission on Science Education of the American Association for the Advancement of Science (AAAS). These 1971 **Guidelines** were prepared in cooperation with the National Association of State Directors of Teacher Education and Certification (NASDTEC) in a fifteen month project supported by the National Science Foundation. Scientists, mathematicians, teachers, NASDTEC members, science and mathematics educators, and students cooperated in the development of the **Guidelines.**

This publication replaces a document published in 1961. Since 1961 there have been extensive changes in the science and mathematics curricula in secondary schools as well as changes in the secondary school system itself. These changes necessitated changes in teacher education programs.

After stressing the fact that all teachers should be liberally educated persons, the 1971 document identifies and expands upon twelve guidelines (two of which deal specifically with mathematics). The guidelines focus on humaneness, awareness and understanding of societal issues, insight into the intellectual and philosophical nature of science and mathematics, competencies in science, minimal mathematical competencies for science teachers, model building in science and mathematics, the communication of science and mathematics, the creation of conditions facilitating learning, the use of materials and strategies in teaching, and the development of a capacity for continuous learning. The two primarily mathematical guidelines are concerned with basic mathematics competencies and algorithms and computing.

The guidelines concerning teacher competencies differ for science and mathematics. Guideline VI spells out specifically what mathematics competencies the prospective teacher should have. Guideline IV deals in broader terms relative to science competencies and assumes that teacher education faculties will provide the "expertise and judgment necessary for acceptable formulation of meaningful competencies for the teaching of the discipline" (p. 17).

This publication is addressed to those responsible for the preparation of secondary school teachers of science and mathematics in colleges and universities, to secondary school teachers and administrators, to state departments of education and other accrediting agencies, and to the lay public interested in the improvement of science and mathematics education in the schools. These guidelines will be useful only as they are widely discussed by all concerned about science and mathematics teacher education and as they are implemented in teacher education programs.

Copies of the **Guidelines** (AAAS Miscellaneous Publication 71-9) will be sent upon request addressed to:

American Association for the Advancement of Science
1515 Massachusetts Avenue, N.W.
Washington, D.C. 20005

Harvard Project Physics Review Completed

Over 60 articles, monographs, and dissertations have been reviewed and summarized by Dr. Wayne W. Welch, University of Minnesota, in producing the Review of the Research and Evaluation Program of Harvard Project Physics.

Dr. Welch, who served as Evaluation Coordinator for Harvard Project Physics (HPP) from 1965—1969, has summarized the findings of the various studies under the headings of methodology, teachers, students, research on learning environments, and final year evaluation results. Overall, findings of the studies suggest that the HPP course was partially successful in achieving the objectives outlined by the course developers.

Copies of the Review may be obtained from:

ERIC Document Reproduction Service
P.O. Drawer 0
Bethesda, Maryland 20014

Ordering information:

ED 059 887 MF $0.65 HC $3.29

SE 017 935

Performance-Based Teacher Education:

What is the State of the Art?

Dr. Stanley Elam, writing for a publication of the American Association of Colleges for Teacher Education, describes performance-based teacher education programs by listing five essential elements:

1) an emphasis on mastery of competencies derived from conceptions and analysis of teacher roles, with these competencies identified in advance;
2) criteria used for assessing mastery of these competencies based on the specified competencies or in harmony with them, with expected levels of mastery under specified conditions being also identified in advance of the time of performance;
3) performance of the student used as primary source of evidence of assessment;
4) student's rate of progress through the program being based on demonstrated competency rather than upon time or course completion;
5) an instructional program focused on facilitating the development and evaluation of student's achievement of specified competencies.

These five essential elements imply additional characteristics. Among these are:

1) Instruction is individualized, personalized, modularized;
2) an individual's learning experience is guided by feedback;
3) the program as a whole is systematic;
4) the emphasis is on exit requirements rather than entrance;
5) the student is held accountable for performance and completes the program only when he can demonstrate the achievement of the requisite competencies.

For such a teacher education program to function effectively, it should be field-centered, use training materials which enable students to focus on concepts and skills which can be learned in a specific instructional setting, involve both teachers and students as designers of the instructional system, and contain a research component as well as a broad base for decision-making involving college faculty, students, and public school personnel. In such a program, preparation for a professional role is viewed as continuing throughout the career of the individual rather than as a task completed within a specified time.

The performance-based teacher education approach is by no means a full movement in the United States. Should it gain momentum, in-service teachers will also feel its impact as emphasis on demonstrated competencies influences evaluation and promotion. At present, many questions remain unanswered as performance-based teacher education programs are being developed. The establishment of valid criteria for evaluating effectiveness is particularly difficult. Pupil learning appears to be the appropriate criterion for assessing effectiveness. However, relationships between teacher behaviors and pupil learning need to be more firmly established through research and improved measurement. Precautions need to be taken so that competencies that are easy to describe and evaluate do not dominate the programs.

The American Association of Colleges for Teacher Education is currently involved in the preparation of papers relating to performance-based teacher education. Eleven publications are projected; of these three are presently available. These are:

Performance-Based Teacher Education: What is the State of the Art?	$2.00
The Individualized, Competency-Based System of Teacher Education at Weber State College	2.00
Manchester Interview: Competency-Based Teacher Education/Certification	2.00

These publications may be obtained by writing:

Order Department
American Association of Colleges
for Teacher Education
One Dupont Circle
Suite 610
Washington, D.C. 20036

Shipping and handling charges will be added to billed orders.

Modular Materials Bibliography Available

A major portion of the March 1972 issue of the newsletter published by the Commission on Science Education of the American Association for the Advancement of Science is devoted to a bibliography of recently published materials presented in modular form. They have been categorized as "modular" in that each is a self-contained and independent unit of instruction with a primary focus on a few well-defined objectives. Those materials cited are representative of a great number available.

Ideally, modules should include clearly stated objectives and should provide for student activities that can be carried out independently by the student. Desirable characteristics are that they be investigative, interdisciplinary, inquiry-oriented, and stimulating.

The bibliography presented in the AAAS newsletter was prepared by Dr. William E. Chace, Washington, D.C. The references described below focus on science education modules. The complete listing contains modules dealing with environmental themes and with the social sciences.

Elementary Level

Learnings in Science. Science Research Associates, Inc., 259 East Erie Street, Chicago, Ill. 60611.
There are four separate "laboratories" in this program for elementary students: "Earth's Atmosphere," "Weather and Climate," "The Solar System," and "Biogeography." The laboratories contain research booklets separated by divider cards. Each section represents a basic concept of the science studied. The first set of questions tests student reading of material; the second, his ability to apply what he has learned. Students engage in both school and home experiments using easy-to-obtain materials. Manuals, charts, etc., are included in the program.

The University of Illinois Astronomy Program. Harper & Row, Evanston, Ill. 60201.
This program, with its six texts and separate guidebooks: "Charting the Universe," "The Universe in Motion," "Gravitation." "The Message of Starlight," "The Life Story of a Star," and "Galaxies and the Universe," is designed to develop theory at a convenient pace. "Highly interdisciplinary, interweaving astronomy's use of mathematics, physical chemistry, physics, geophysics." Prepared for grades 5-10.

Mr. Wizard's 400 Experiments in Science, well known from TV broadcast and now incorporated in a book by Don Herbert and Hy Ruchlis (Book-Lab, Inc., 1449 37th Street, Brooklyn, N.Y. 11218, $1.95).
This book provides modules for student activity grades 5-9. Materials used are easily available within the community.

On My Own—Bite Size Science. Harcourt Brace Jovanovich, 757 Third Avenue, New York, N.Y. 10017. Typical of several publishers' approach to modular instruction. It consists of a series of leaflets for the student with reading difficulty and offers 50 investigations per level. Some investigations can be completed in a class period; others require several days. Leaflets and a science dictionary comprise the materials.

Science Reading Adventures, American Education Publications, Education Center, Columbus, Ohio 43216. This series is directed to a particular reading level. The ten or so units (modules) in a single booklet, capitalizing on themes of expected student interest ("Spying on Spiders," "Jet Away in a Giant," etc.) constitute activity-oriented lessons. They call for process skills in observing, classifying, inferring, using numbers, measuring, and communicating.

Secondary Level

GM **Progress of Power,** Technical Information Department, GM Research Laboratories, Warren, Michigan 48090.

A "state of the art" report called **Progress of Power** featured 44 exhibits and 26 special vehicles. The vehicles were powered by unconventional systems—turbine, steam, electric, Stirling, and hybrid systems as well as experimental piston engines that sharply reduce emission of air pollutants. This publication contains information on the experimental power systems and vehicles displayed. GM also publishes a 4-page bimonthly, **Search,** devoted to efforts to control pollution from motorcar engines. See also, **Progress in Areas of Public Concern,** available from GM Proving Ground, Milford, Michigan 48042.

Reactions and Reason, an introductory module, by high school teachers and teachers in the Department of Chemistry (University of Maryland) in cooperation with the Science Teaching Center, University of Maryland, College Park, Md. 20742. Seeking to design a new approach to the study of chemistry, these professionals, without benefit of grant funds, have produced a trial edition, with teachers guide, of the first of eight interchangeable modules. Purposes of the overall program are to popularize chemistry and to extend chemical education to a larger audience by making it "more interesting, more fun, more readily adjustable to local situations, and more in tune with the times." The group plans to reinforce and extend the concepts of chemistry presented in the introductory module with others having geochemistry, biochemistry, and inorganic, organic, nuclear, physical and environmental chemistry themes.

How the Jet Engine Works is a sample title of materials of the modular type offered by the American Gas Association, Inc., 1515 Wilson Blvd., Arlington, Va. 22209. The kits, designed by teachers for the purpose of applying the principles of natural gas energy to the student's world, are for use at the junior and senior high and junior college levels and in science and social science studies. The materials include experiments, overhead projection transparencies, student report sheets, wall charts, and filmstrips.

The NSTA (1201 16th Street, N.W., Washington, D.C. 20036) makes available an excellent series of "How To . . .," timely aids for developing modules. Each of the 18 pamphlets contains an analysis of the topic, photos and charts, instructional suggestions, and bibliographies. Three recent titles:

How To Study the Earth from Space, by Robert E. Boyer, Professor, Department of Geological Sciences, University of Texas at Austin, 12 pp., 50c.

How To Read The Natural Landscape in Forests and Fields, by Millard C. Davis, Editorial Associate, NSTA, 12 pp., 50c.

How To Present Audible Multi-Imagery in Environmental Ecological Education, by Pascal L. Trohanis, Educational Technology Center, College of Education, University of Maryland, 8 pp., 50c.

College and Graduate

Matter-Antimatter and Cosmology and **Continental Drift** are the themes of two of a series of Physics Resource Packets sponsored by the Commission on College Physics and prepared primarily to help two-year college physics teachers in presenting one or two lectures on a given topic. Each packet contains reprints of leading articles on the subject, a series of related slides for the lecturer's projection, and suggested further reading. Available from American Association of Physics Teachers, 1785 Massachusetts Avenue, N.W., Washington, D.C. 20036.

Short Courses. A considerable number of professional associations periodically present short courses for their members which include lectures, films, filmstrips, guides, and charts, all for the purpose of bringing participants up to date on specific phases of the organization's field of interest. The courses offered by the American Chemical Society, 1155 Sixteenth Street, N.W., Washington, D.C. 20036, are perhaps the most comprehensive. ACS has developed 60 short courses, presented first at national or regional meetings and then sold as kits (lectures, films, and filmstrips) for use by groups or individuals. The Society terms as **modules** the assembly of courses in a single field, e.g., under the heading "Chromatography" and separate courses in gas, modern liquid and thin-lay chromatography. Each requires one to three days for execution. The Council on Education in the Geological Sciences, 2201 M Street, N.W., Washington, D.C. 20037, is another example of professional organizations which sponsor or stimulate short courses and seminars to update their members and make the materials available for use by other interested persons.

Statistics for Problem Solving and Decision Making is a course presented through 10 half-hour films and 10 related texts in an individualized instruction format, no instructor needed. Aimed at executives and professionals in marketing, accounting, business systems, engineering and related fields. Course covers: concepts and vocabulary; describing collections of data; getting information from data; collecting data efficiently; charting, forecasting, deciding between two alternatives, estimating the cost of uncertainty, relating two or many variables. The VISTEX course (Visualized Instruction with Structured Texts) has no prerequisites outside of basic mathematics. Contact: R. L. Craig, Westinghouse Learning Corporation, 1426 Westinghouse Building, Pittsburgh, Pa. 15222.

BIOTECH Teaching Modules for training biotechnicians will be developed by AIBS during 1972-73. Emphasis will be placed on eight topic areas, among them animal techniques, e.g., handling rodents; and microbial culture methods, e.g., how to isolate a single cell. Write to John H. Busser, Director, Project BIOTECH AIBS, 3900 Wisconsin Avenue, N.W., Washington, D.C. 20016.

The Use of Modules in College Biology Teaching. Joan G. Creager and Darrel L. Murray, eds. (Commission on Undergraduate Education in the Biological Sciences, 3900 Wisconsin Avenue, N.W., Washington, D.C. 20016, 1971, 173 pp.). A valuable source book for any study of modules, biological or otherwise. In the preface Edward J. Kornomdy, former director, CUEBS, says that the development of modules offers "a decided opportunity to effectively achieve individualization of learning" and submits that "modules will perhaps become the major pedagogical tool in education—at all levels!" Representative subjects treated include: "What Modules Are and What They Do," "Advantages and Applications of Modules," "What Some Current Modules Look Like," and "What Future Development of Modules May Bring."

A 200-page catalog "Video Tapes for Teacher Education" (Fall, 1971) is the product of the Video Tape Project conducted at Carleton College, Northfield, Minn. 55057, and supported by grants from the Charles F. Kettering Foundation and the NSF. Fifteen nationally recognized curriculum study projects as well as many schools cooperated. Tape descriptions cover modern foreign languages, science and mathematics, and social studies. A valuable source book for teaching courses along modular lines, especially in open-ended discussions of problems associated with the classroom teaching-learning process.

Miscellaneous

Industrial organizations have developed kits containing sample products accompanied by equipment and workbooks for experiments; e.g., Union Carbide's program featuring "Seed-Gro" and "Micro-Gro" for use in elementary and secondary life-science studies.

Another example of commercial groups offering module-type educational materials is the aviation industry. The Cessna Aircraft Division, Wichita, Kan. 67201, has prepared a list of "Specific Resources for High Schools" itemizing aviation texts, sources of materials, and teachers' guides for high school instruction.

Professional organizations developing individual projects of the module type include the Oregon Psychological Association which is experimenting with a Traveling Operant Lab for high schools. The lab, which includes an itinerant pigeon, a cage, an operant chamber, and a control panel, is available to interested schools. With it come instructions, suggestions for experiments, and a lab manual. Delivery is made by a psychologist who briefs the teacher on the lab's use.

Constructing Instruction on Behavioral Objectives, by Henry H. Walbesser, et al., University of Maryland, College Park, Md., 1971, 60 pp.

This booklet, with the subtitle "A Manual for Managers of Learning," shows teachers how to base their instruction around the concept of establishing behavioral objectives. Possibly of use in developing courses featuring the modular approach.

Professional organizations developing individual projects of the module type include The National Public Relations Association, NEA, 1201 16th Street, N.W., Washington, D.C. 20036, has prepared a series of cassettes, records, and filmstrips, most for administrators and teachers but some for students. Among the latter is "How To Study and Why," including two records and two cassettes. They can be used by large groups or by students individually. The ten messages include "How To Take Notes," and "How To Do Homework." Record album, $9.95; cassette album, $18.50.

In October 1970 the Division of Curriculum, Department of Public Instruction, Grimes State Office Building, Des Moines, Iowa 50319, issued a four-sheet memorandum, with bibliography, on "Learning Packages." Such packages are essentially modular since the definition is: "A conceptually based program of instruction, using multi-media and multi-mode techniques, and designed to individualize instruction according to the individual aptitudes, attitudes, and interests of students."

System Development Corporation Service Announced

The System Development Corporation of Santa Monica, California, has announced the development of a new, inexpensive service to enable colleges, universities and libraries to search the ERIC data base via a computer terminal. Some of the materials input and indexed in the ERIC system have been available on computer-readable tape but no nationwide service through which educators and educational information specialists could directly search the ERIC file existed.

SDC has the ERIC data base and other current educational materials stored in its large-scale, time-shared computer in California. The computer is connected to a multiplexer unit in Washington, D.C. This means that you can use your ordinary telephone or TWX system to dial the SDC/ERIC service at the location closer to you. All you need to do is dial a special number, then connect the telephone receiver to your terminal and start typing your information requests.

The SDC/ERIC data base contains citations to over 75,000 items, dating back to 1966, and published on a monthly basis in **Research in Education** and **Current Index to Journals in Education.** This data base is updated with new citations quarterly. The SDC/ERIC file will soon contain selected items identified by educational information centers in California. Nationwide users of the service will have access to these items also.

Documents may be requested according to any or all of the following categories:

Accession number
Clearinghouse code
Author
Titie
Publication date
Descriptors
Identifiers
Institution or source of origin
Sponsoring agency
Issue

Through the use of simple retrieval commands, multiple categories may be selected within a single request. If a printout of all the items found in a search is desired, it can be accomplished on-line (at the terminal) or off-line. Most users with a large number of items to print prefer off-line printing, due to the savings in terminal time costs. Off-line printed items are airmailed to your address the same day as requested, usually resulting in delivery within 48 hours.

The cost of the SDC/ERIC search service is variable, depending primarily on: terminal time required, communication distance, and type of terminal utilized. Experience has shown that 6 to 15 on-line searches can be carried out in one hour.

For further information, contact:

System Development Corporation
2500 Colorado Avenue
Santa Monica, California 90406
Att'n.: SDC/ERIC Search Service, Room 3113

USDA Offers Suggestions for Outdoor Study

The active involvement of students is emphasized as a major vehicle for gaining an appreciation of the environment in a booklet produced by the Soil Conservation Service of the U.S. Department of Agriculture. The booklet contains suggestions for beginning to use the outdoors for study as well as possible topics for this study.

Single copies of the booklet are free and may be obtained by writing:

Office of Information
U.S. Department of Agriculture
Washington, D.C. 20250

Additional copies cost 25 cents and are available from:

Superintendent of Documents
Government Printing Office
Washington, D.C. 20240

National Clearinghouse for Drug Abuse

The National Clearinghouse for Drug Abuse Information publishes bibliographies which are short, representative listings of citations on subjects of topical interest. The selection of the literature included in each bibliography is based on its currency, its significance in the field, and its availability in local bookstores or research libraries.

The scope of the material is directed toward students writing research papers, special interest groups, such as educators, lawyers and physicians, and the general public requiring more resources than public information materials can provide. Each reference series is meant to present an overview of the existing literature but is not meant to be comprehensive or definitive in scope.

The National Clearinghouse for Drug Abuse Information, operated by the National Institute of Mental Health on behalf of the federal agencies engaged in drug abuse education programs, is the focal point for Federal information on drug abuse. These Federal agencies are the Department of Justice, Bureau of Narcotics and Dangerous Drugs; Department of Health, Education, and Welfare; Office of Economic Opportunity; and the Department of Defense. The Clearinghouse distributes publications and refers specialized and technical inquiries to federal, state, local, and private information resources.

Inquiries should be directed to:

National Clearinghouse for Drug Abuse Information
5600 Fishers Lane
Rockville, Maryland 20852

Science Self-Test Available

The Scientific Manpower Commission, a non-profit organization of representatives of all of the major scientific societies, has issued a self-test for high school students who think they might have an interest in scientific careers. Called "Test Yourself for Science," the test is accompanied by a bibliography of career information in science and engineering called SEARCH.

Copies of the test are available, for $1.00 each, from:

Scientific Manpower Commission
2101 Constitution Ave., N.W.
Washington, D.C. 20418

Teachers Needed by Peace Corps

Developing countries are asking the Peace Corps for science teachers to help meet their needs. There are openings for teachers in Africa, the Carribbean, Asia and the Pacific for volunteers to work in secondary schools and colleges. In addition to doing classroom teaching, the volunteers will also do inservice training for elementary and secondary school science teachers. In some locations they will also work with universities in preservice teacher education programs.

Peace Corps assignments require ingenuity. Teachers are asked to adapt experiments and exercises to materials found in the country and to design and improvise apparatus from local materials. They may help design new curricula or set up training seminars and workshops. Peace Corpsmen are also involved in such science-related programs as nutrition, food production, ecology, health, economics, and communications systems.

Experienced teachers with BS or MS degrees in physics, chemistry, biology, general science, or combined science-mathematics backgrounds are needed.

Additional information may be secured by writing:

Peace Corps/ACTION
P-400
Washington, D.C. 20525

Calls may be made, toll-free, to 800-424-8580.

R & D Center for Science Education Funded

A Center for Research in Science Education was awarded to the Lawrence Hall of Science, University of California, Berkeley. This is the first National Science Foundation supported science education project emphasizing research and development in science education.

The $256,210 grant enables the Hall of Science to continue its many activities in curriculum development, teacher preparation, research in science education and mathematics, and implementation of new science and mathematics courses in schools and colleges.

Five projects will begin under the initial one-year grant. They are:

Intellectual Development: directed by Dr. Robert Karplus, the research will attempt to gain more information about the student and his capabilities and limitations, in order to design more effective science courses.

Individualized Instruction: researchers under the direction of Dr. Herbert D. Thier will explore ways to organize learning groups (of students) at various age levels to encourage the best mix of individual and group activities.

Research in Teacher Preparation: jointly directed by Drs. Lawrence F. Lowery and John Miller, this project will be conducted for preservice and inservice teachers and administrators from the Mt. Diablo (Calif.) Unified School District so they can develop better instructional programs through research in human learning and course development.

Function and Organization of the College Biology Laboratory and **Open Instruction in the College Physics Laboratory:** both seek information on how to provide greater independence and intellectual relevance for the college student. The biology project is directed by Dr. Watson M. Laetsch; the physics by Dr. Allan M. Portis.

SMEAC Science, Mathematics, and Environmental Education Information Analysis Center

NEWSLETTER

AN ERIC CENTER

Science Education — Volume 5, Number 4, 1971

Research Review Published

A Review of Research Related to Environmental Education by Robert E. Roth and Stanley L. Helgeson of ERIC/SMEAC identifies and reviews 87 studies having relevance to environmental education. The majority of these studies, reported 1950-1970, were oriented toward outdoor or conservation education, thus being forerunners of environmental education as it is currently viewed.

The 50-page review is available from:

Center for Science and Mathematics Education
Room 244 Arps Hall
The Ohio State University
Columbus, Ohio 43210

Single copies are priced at $1.50. A ten per cent discount is offered on ten or more copies to the same address.

Science Folio Available Through ERIC

In 1956 the Cooperative Test Division of Educational Testing Service published **Questions and Problems in Science**, otherwise known as the **Science Folio**. Assembled by Paul L. Dressel and Clarence H. Nelson, the book is essentially a large collection of test items in the biological and physical sciences taken from items contributed by many institutions of higher learning. It is intended to aid college instructors in constructing tests that would adequately reflect local course content and objectives. The several thousand items are grouped according to their subject-matter content and, using the subcategory numbers of the cognitive domain of the **Taxonomy of Educational Objectives**, the objective being tested is indicated for each item.

Although many of the items come from introductory college science courses and were produced in the mid-1950s, some of these items are suitable, with modifications, for today's high school science courses. However, the **Folio** has long been out of print. It is now available through the ERIC system, in hard copy for $29.61 for the 850 pages or in microfiche for $0.65.

If interested, order ED 054 231 from:

ERIC Document Reproduction Service
P.O. Drawer 0
Bethesda, Maryland 20014

Science Teachers Need Retooling, Physics Group Says

Most science teachers in the nation's schools are not qualified to explain the daily advances made in the field of physics, the National Academy of Sciences' Physics Survey declared in a report of a two-year study of the field. As American society grows more and more dependent upon scientific technology, the need for an increased public awareness of the basic principles of physical science has become greater, the committee said in its exhaustive survey entitled **Physics in Perspective.**

The current stock of ill-prepared science teachers will keep the next generation of students in the dark about physics, the Committee said in rejecting the idea that simple improvements in the science courses in colleges of education will solve the problem. Under standard tenure practices, the current crop of young teachers will help continue scientific ignorance. What is needed instead, the report said, is extensive inservice training of all science teachers to bring them to higher levels of competence in the subject.

There is little demand now for trained physicists, the report admitted, but it warned that there is danger in overreacting to the current oversupply of scientists. Simply assuming that the existing stock of physicists is sufficient will subject the profession to periodic ups and downs in the labor market. The committee estimated that it takes about 11 years to train a physicist and it recommended that surveys attempt to estimate when they will be most needed so that schools can begin to encourage students to enter the field long before a shortage hits.

As an example of the manpower problems in science, when a national effort to encourage students to enter science fields was begun in 1961, specific numerical goals were set. These goals were met by 1968, the committee said, with the result that many Federal incentive funds dried up. But the students who had been recruited are still in science programs, with little chance to change majors and poor prospects for employment. If the nation overreacts and science education goes into a slump, the country will be caught short by the under-supply of physicists that the committee estimates will strike in the late 1970s. Effective manpower planning, the committee said, is very important in the skilled field of physics.

The 1000-page report will soon be available in hardback for $25.00 from:

Printing and Publishing Office
National Academy of Sciences
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

SE 017 935

Center For Unified Science Education Established

A grant from the National Science Foundation to the Federation for Unified Science Education (FUSE) has made possible the establishment of the Center for Unified Science Education. Located at The Ohio State University, the Center will coordinate its activities with those of the College of Education's Faculty of Science and Mathematics Education and with the ERIC Center for Science, Mathematics and Environmental Education. Dr. Victor Showalter, who has been involved in many unified science education projects since 1959, will direct the FUSE Center.

The immediate functions of the Center will be (1) to disseminate the concept of unified science education, and (2) to facilitate implementation of high quality unified science programs in individual school systems throughout the nation. Unified science programs dissolve or greatly minimize the traditional boundaries between the specialized sciences.

The Center publishes its own newsletter, Prism II. Further information concerning the Center and its activities may be obtained by writing to:

Dr. Victor Showalter, Director
FUSE Center for Unified Science Education
1460 West Lane Avenue
Columbus, Ohio 43221

IDEA REPRINTS AVAILABLE

The Institute for Development of Educational Activities, Inc. is an affiliate of the Charles F. Kettering Foundation and is charged with providing the educational profession and the public with concise information and recommendations on problems and practices effecting the schools. One of its current projects has resulted in the publication of a series of reprints of articles which have appeared in the "I D E A Reporter" as well as reports on seminars and research papers commissioned by the Institute.

A selected list of these publications includes:

The British Infant School	$2.00
The Chemical Transfer of Memory: A Report of Research and Implications	1.50
High School Students and Drugs	1.00
How to Enhance Individuality in Learning	1.00
Innovations in the Elementary School	1.00
Learning in the Small Group	2.00
The Schools and the Environment	1.50
Decision Making in Curriculum and Instruction	1.50
Student Activism	1.00
Early Childhood Education	1.00
Curricular Innovations	1.00
Performance Contracting	1.00
Population Education	1.00
Individually Guided Instruction	1.00
Descriptive Catalogue of Materials	Free

Orders should be accompanied with payment (prices include postage and handling) and mailed to:

I D E A Mail Orders
P.O. Box 628
Far Hills Branch
Dayton, Ohio 45419

Publications On Inquiry Teaching Available

Six publications related to the Development of Inquiry Skills Program (DIS) developed by personnel at the Mid-Continent Regional Educational Laboratory are now available.

These are:

A General Model for Teacher-Directed Inquiry	.70
An Evaluation of Self-Assessment Techniques	.70
Inquiry Objectives in the Teaching of Biology	1.50
Recording Teacher and Pupil Verbal Inquiry Behaviors in the Classroom	.85
Appendices to An Evaluation of Self-Assessment Techniques and A General Model for Teacher-Directed Inquiry	2.50
Learning Through Inquiry	1.00

These may be ordered by writing:

Mid-Continent Regional Educational Laboratory
104 E. Independence Ave.
Kansas City, Missouri 64106

ESEP Materials Available

Sensorsheet is the title of a newsletter co-published by the Environmental Studies Project and the Earth Science Teacher Preparation Project. This quarterly publication may be obtained by writing:

Earth Science Education Program
Box 1559
Boulder, Colorado 80302.

Additional materials available to teachers include a free bibliography of research studies relating self-concept to achievement in school; **The Cutting Edge** ($3.00), accounts of teachers and students concerning their experiences with open education; a poster packet ($4.00); and the environmental studies kit ($20.00), a collection of 75 assignment cards which are invitations to develop awareness and investigation strategies to be applied to particular aspects of self and the environment.

Purchasable materials may be obtained by sending a check or money order payable to:

AGI
Box 1559
Boulder, Colorado 80302.

OE Backs Metrication Program For Teachers

With the country's impending changeover to the metric system, teachers not quite sure of their measurements will be able to get help from the Center for Metric Education, recently established at Western Michigan University under a three-year OE grant totaling $163,214. In training teachers to understand and use metric equipment, the pilot program will concentrate during its first year on developing instructional materials. During the two followup years, the center will field-test materials and conduct seminars at colleges and universities throughout the nation.

Evaluation Supplements Developed By SCIS

The Science Curriculum Improvement Study has begun the development of evaluation supplements to enable teachers to document the achievements of their pupils. Drs. Robert Karplus and Rita Peterson have created a design for evaluation, and two supplements have recently been published in trial edition.

SCIS personnel see three broad emphases or purposes for evaluation: (1) informal evaluation or feedback, which the teacher gathers from student reactions to the teaching program; (2) documented evaluation, which the teacher gathers from student reaction to prescribed activities and for which he records results, and (3) research evaluation, which is gathered by individuals or groups interested in investigating aspects of the SCIS experience.

Information evaluation has been built into the SCIS program. In the guide for each unit, the teacher is referred to activities and situations that will yield information regarding pupil progress. Documented evaluation, as provided in the new evaluation supplements, helps the teacher communicate his findings objectively to parents and administrators as well as providing the teacher with criteria for identifying attainment of objectives to help him determine if the child has achieved a goal. Research evaluation is considered to be the task of specialists.

SCIS's long-term goal is scientific literacy. This combines an understanding of both content and process-oriented concepts with a positive and inquiring attitude toward science. Such a goal is far more complex than the attainment of a body of facts. Thus, the evaluation supplements identify three phases of a pupil's growth and assess them separately: attitudes in science, perception of classroom environment, and concept/process objectives.

The "attitudes in science" phase answers the question "In what ways is each child behaving like a scientifically literate individual?" and instructs teachers to look for evidence of positive attitudes in science in four areas. These areas are (1) curiosity or interest, (2) inventiveness, (3) independent or critical thinking, and (4) persistence. The supplement assists the teacher by identifying examples of the behaviors and situations in which they are likely to occur. A profile form is provided on which each child's attitudes may be described.

The "perception of classroom environment" phase answers the question "Do the pupils feel they are active participants in the science activities?" and "Do the pupils generally like their science activities?" Two answer pages are provided for children's responses with which teachers may compare their perception of the class. For the lower grades, children are provided with happy, serious, sad, or angry faces to circle as indicative of their feelings about an activity.

The "concept/process" phase answers the question "How closely is each student attaining some of the specific objectives of the unit?" Activities involving individuals and groups assess the major concept and process outcomes of a unit, with interviews and small group discussions held at regularly scheduled times. Documentation is kept on individual or class profiles.

Teachers are cautioned against using the evaluation supplements to make comparisons among students. Instead the teacher is encouraged to identify the progress of each child throughout the year. SCIS personnel feel that attempting to guarantee certain minimum accomplishments completely violates the openended and exploratory nature of the SCIS program as well as depriving the teacher of the freedom to develop each child's capabilities and interests at his own level.

Supervised field tests of the first two evaluation supplements are currently underway in school systems in nine different states. The emphasis in this intensive field test is on the supplements themselves, their design and usefulness in the classroom as a valuable adjunct to the teaching program. The result of the field tests will provide the input for the revisions necessary in the two published supplements, and information obtained will also be used in the design and production of supplements for other units.

SCIS Materials Modified For Visually Impaired

Dr. Marcia Linn has designed an evaluation study for Adapting Science Materials for the Blind (ASMB). This project, under the leadership of Dr. Herbert D. Thier, is focused on modifying SCIS units for use with visually impaired children.

The effectiveness of ASMB's adaptations of "Material Objects," "Organisms," "Interaction and Systems" and "Life Cycles" has been studied. Evaluation is now underway for the "Subsystems and Variables," "Environments," "Communities," and "Models: Electric and Magnetic Interactions" adaptations.

Trial editions of the adaptations are taught to classes of visually impaired students at the Frances Blend School in Los Angeles. Both pretests and posttests are used. Children perform experiments using materials and are then informally interviewed, both individually and in small groups. Some children from the Frances Blend School and the California School for the Blind in Berkeley serve as controls. In the completed evaluations, the students in the experimental group made significant gains on the major objectives of each unit.

These data are used to make decisions during the revision of the adaptations. Drs. Linn and Thier may later adapt the evaluation materials for use by the classroom teacher in evaluating student progress and by school districts in diagnosing science skills of visually impaired students.

Reference Volumes Available

"Molecular Structures and Dimensions" is a new series of standard reference volumes published by the International Union of Crystallography in conjunction with the Crystallographic Data Centre, Cambridge, England. The aim of the series is to make the results of structural investigations by diffraction and related methods readily available to all scientists interested in molecular structures. It is designed to be easily usable by specialist crystallographers and by academic and industrial research workers in the related fields of chemistry, biochemistry, molecular biology, and pharmacology.

The first two volumes contain classified bibliographic information for over 4,000 structures. Volume 1 deals with general organic crystal structures and Volume 2 with complexes, organic metals and metalloids. Entries are arranged in chemical classes with extensive cross-references. Individual compounds can be located through the formula or metal index. There is also an author index. Literature coverage is comprehensive from 1935 until January 1, 1969. There are additional references to 1969 publications. The 1969-70 volume is already in preparation.

Volume 1 costs $9.00; Volume 2, $7.50 for personal copies. Library copies cost $12.50 for Volume 1; $10.00, for Volume 2. These volumes may be ordered from:

Polycrystal Book Service
P.O. Box 11567
Pittsburgh, Pennsylvania 15238

Bilingual Science Center Established

The Cutler Elementary School in the Cutler-Orosi Unified School District, California has set up a bilingual math-science center as a supplement to its regular science program. Using the center, a study was devised to test whether Spanish-speaking children are better able to solve problems in a logical, scientific manner if they are taught in both Spanish and English, rather than in English alone. Subjects of the study were sixth-grade students at the Cutler School, most of whom are from Mexican-American backgrounds. The students were pretested with the odd-numbered questions of the Sequential Test of Educational Progress: Science, Form 4B. Though this is a standard test, it was not administered in the standard fashion; it was translated into Spanish, and the children were given the option of taking the test in English or Spanish.

After pretesting, a random selection yielded an experimental group of 15 students, with the remaining students forming a control group. The experimental students followed a ten-week program, attending the center a half hour every day. Throughout the center's program, instruction was given to the experimental group in both English and Spanish. At the end of ten weeks both groups of students were tested with the even-numbered questions of Form 4B. The experimental group experienced a six-point increase in the median scores; whereas the control group's median scores did not increase at all. The researcher believes it is additionally significant that one-third of the experimental group took the test in Spanish compared with only one-quarter of the control group.

The author of the report points out that the experimental group was very small and that the test did not evaluate changes in the behavior of the experimental group and therefore does not reflect the increased participation in class discussion by the experimental students. In addition, the test required some factual scientific knowledge; thus, it was not purely a test of problem-solving ability. One of the major conclusions of the report is that a bilingual math-science learning center is a valuable asset in the education of bilingual children.

The report, "A Bilingual Math-Science Learning Center," (ED 051 716) can be purchased in microfiche (65c) or in hard copy ($3.29) from:

ERIC Document Reproduction Service
P. O. Drawer 0
Bethesda, Maryland 20014

Series Of Science Films Available

In 1971 the National Science Teachers Association and Allegro Film Productions agreed to collaborate on a series of science motion pictures to be distributed to junior and senior high schools. The objective of the series, called "Science Screen Report," is to bring new developments in science and technology into the classroom.

Allegro plans to release one news film each month, nine times during the school year. Teachers' guides will accompany each monthly issue to aid in structuring class discussion after viewing the 20 minute film. At the end of the school year a complete "Science Screen Report" index will be provided so that the films may be used in the next year's planning.

At present the series is being sold on a sponsorship basis to community-minded corporations, banks, and other institutions. The sponsoring agency attaches a commercial on the beginning and end of each film. Allegro has announced that the series will soon be made available to schools for direct purchase at a 40 percent discount, eliminating the need for a sponsor.

Those wishing more information should write to:

Jerome G. Forman
Allegro Film Productions, Inc.
201 W. 52nd Street
New York, New York 10019

Resources For Youth Newsletter Available

RESOURCES FOR YOUTH is the title of a bulletin published by the National Commission on Resources for Youth, a non-profit organization begun in 1967 by a group of educators, social scientists and businessmen. The Commission has disseminated information on innovative programs which provide youth with opportunities to assume rewarding and responsible roles in society, as well as helping develop model programs.

"Youth Tutoring Youth" is a model begun by the Commission in the summer of 1967 which has been developed into a nation-wide program with 400 cities participating. Most of the tutors are employed through Neighborhood Youth Corps and are in academic difficulty themselves. These junior high and high school tutors teach elementary school children on a one-to-one ratio.

The focus for the Winter 1972 bulletin was on health programs. Five programs, from the more than 500 on file with the Commission, are described. They emphasize community health, health education, the detection of lead poisoning, air pollution, and aid for young people in trouble. The next issue will be focused on ecology programs.

Teachers are urged to write the National Commission to share information on their own programs, to request information on programs which they might like to visit, or to be placed on the mailing list for the bulletin. Communications should be sent to:

National Commission on Resources for Youth
36 West 44th Street
New York, New York 10036

ETV Course Promotes Development Of Scientific Literacy

The National Instructional Television Center has produced a 15 lesson course that is designed to help make sixth grade students scientifically literate. These programs, entitled "The Science Shed," consider functional and fundamental concepts derived from science that can further the educational development of the student, via the process of inquiry.

The course emphasizes three elements of science: the investigative process, the development of facts and concepts as a result of investigation, and the application of the knowledge gained in controlling or modifying the environment. The programs aim at developing critical thinking and establishing the importance of evaluation based on observation as well as posing the idea that there is not always a set answer in science. Students are encouraged to seek answers through their own experimentation rather than in a textbook.

The teacher's manual provides comprehensive preparatory information. Lesson plans include behavioral objectives, the basic ideas for each lesson, a list of the materials necessary for proper utilization, suggestions for pre- and post-lesson activities, general comments to assist the teacher, and a list of resource materials.

The fifteen lesson topics are:

Measurement Topics and Techniques
A Study of a Pond
A Study of a Stream Valley
Between the Lines (graphing)
Measuring Time
Pegboard Balance
Density
Chemical Reactions
Relative Motion
Planets
Heat Transfer
Force
Design of an Experiment—Plants
Reactions to Stimuli
Hidden Properties

The series was produced by the Nebraska Council for Educational Television and is available from NIT. Preview materials consist of one or more representative lessons and a copy of the teacher's manual. Preview lessons are available on 16mm film. These materials are sent on request at no charge to those interested in considering the in-school use of this course. A handling charge of $7.50 per lesson is made when a user requests materials other than or in addition to the standard preview materials.

Requests for preview materials should be made to:

Field Services
National Instructional Television
Box A
Bloomington, Indiana 47401
Telephone: 812-339-2203

Mathematics Laboratory Project Underway

The staff of ERIC/SMEAC has begun work on a special mathematics laboratory project. This project will identify and disseminate innovative practices in mathematics teaching via an activity or laboratory approach. The primary thrust of the project will be the preparation of a general handbook on mathematics laboratories and activity learning addressed to mathematics education specialists. This handbook will include rationale and objectives for activity learning in mathematics, a review of procedures for establishing activity learning programs in mathematics, a review of research on activity learning, and a large resource section containing descriptions and explicit instructions for activities for mathematics classes organized by content topic and grade level.

Mathematics education specialists will review and evaluate the general handbook. In accordance with their evaluations, the original resource materials in the handbook will be revised to form two target publications for classroom teachers of mathematics. These publications will be targeted to teachers of disadvantaged low-achievers in mathematics (grades K-9), and to teachers of exceptional children in mathematics (grades K-9). The two final resource publications will provide a new source of carefully evaluated teaching materials which have the potential of significantly changing educational practices in the teaching of mathematics to disadvantaged low-achieving students and to exceptional children (disabled or mentally handicapped students).

Many of the materials we have received are extensive self-contained laboratory units. These materials will be announced in future issues of **Research in Education** and will be available from the ERIC Document Reproduction Service. We anticipate that final versions of the project handbooks will be available by spring or summer, 1973. Future issues of the newsletter will contain progress reports for the project as well as the availability of materials.

PTC Toxicity Noted

Recent articles in *Nature New Biology* (235:93, 1972) and *New Scientist* (53:188, 1972) have pointed out that the well-known "tasting" substance phenylthiourea (also known as phenylthiocarbamide) may be toxic to humans. The LD_{50} in rats is 3.0 mg/kg body weight, (i.e., such a dose kills 50% of test animals). The toxicity of PTC has not been determined for humans but the LD_{50} dose for rats may be approached by non-taster human test subjects if 10 ml of each of the usual series of tasting solutions of progressively increasing concentrations is swallowed. (That is, 10 ml of each of the eleven serial dilutions made by the half strength method from a standard solution of 0.13% PTC.) The dose from a single test paper, made by entirely soaking up 100 ml of A.R. acetone containing 0.5 g PTC into filter paper, and cutting the dried paper into 1 cm x 2 cm strips, would be very low, but they should not be swallowed. Non-tasters should NOT be permitted to "taste" crystals of PTC.

There appears to be no need to discontinue the use of this test for an interesting genetic polymorphism in man, but the final comment from the *New Scientist* comment should be heeded: "Those employing the test are strongly advised to exercise caution, together with vigilance concerning the spitting out of test samples and the avoidance of repetitive dosing of the same individuals."

SMEAC Science, Mathematics, and Environmental Education Information Analysis Center

NEWSLETTER

AN ERIC CENTER

Science Education — Volume 5, Number 1, 1973

Center Comments

NEW ADDRESS

As of March 1, 1973 ERIC/SMEAC has a new address:

ERIC/SMEAC
400 Lincoln Tower
1800 Cannon Drive
The Ohio State University
Columbus, Ohio 43210

RIE PRICE CHANGE

Effective January 1, 1973 the yearly subscription price for RIE will be $38.00, Domestic; $47.50, Foreign; Single copy, $3.25.

Science Education Activities of ERIC/SMEAC

During the past year the Science Education division of ERIC/SMEAC has engaged in a variety of activities, only one of which is the production of this newsletter. To advise our readers, a brief summary of these activities follows.

The Science Education division of ERIC/SMEAC edited and produced the compilation of abstracts of papers presented at the Forty-fifth Annual Meeting of the National Association for Research in Science Teaching. Distribution of this publication at the NARST meeting in Chicago in March, 1972, was followed by a trip to New York City in order to set up an ERIC display in the exhibition area for the National Science Teachers Association convention.

ERIC/SMEAC staff members were available at the display booth to distribute newsletters and copies of **How to Use ERIC for Science Education**, and to answer questions about searching for documents in the ERIC system. Having this display also provided science teachers the opportunity to have their names and addresses added to the newsletter mailing list.

During the year, specially commissioned ERIC/SMEAC publications were produced. Documents by Walbesser, Lucas, and Roth and Helgeson were written and printed. These documents consisted of reviews of research and occasional papers. Occasional papers do not necessarily emphasize or concentrate on research studies but are produced in response to interest in a particular topic or area.

In addition to reviews of research and occasional papers, ERIC/SMEAC cooperates with the National Association for Research in Science Teaching to fund invited speakers for the general sessions of the NARST Annual Meeting. In return, these individuals submit their speeches in written form to ERIC/SMEAC to be used as occasional papers. These papers are also published in the **Journal for Research in Science Teaching** and are therefore available other than through the ERIC system.

In July the Advisory Board for the Science Education division met in Columbus. The membership is composed of Dr. Alan M. Voelker, representing individuals interested in elementary school science education; Ms. Dorothy Curtis, representing science curriculum developers; Dr. Les W. Trowbridge, representing the National Science Teachers Association; Mr. George Katagiri, representing science supervisors; and Dr. J. David Lockard, representing science educators. The Advisory Board is charged with recommending policy changes, identifying areas to be covered by publications, and generally acting as a sounding board for the science education community.

During the summer, state science supervisors were contacted by mail for an indication of their interest in attending planning meetings to be held in conjunction with the NSTA meetings to be held in several parts of the country in the Autumn. The proposed function of these meetings was to obtain suggestions from the state supervisors for activities and publications that the Science Education division could produce which would help the supervisors make ERIC services and products more accessible to the classroom teacher. Two meetings were held, one in St. Louis and one in New Orleans. These meetings resulted in a variety of suggestions for ERIC publications and services. These suggestions are to be acted upon during the coming months.

In October, 1972, the Publications Committee of the Association for the Education of Science Teachers met in Columbus at the ERIC Center to discuss possible joint projects of AETS and ERIC/SMEAC. As a result of this meeting work was begun to produce a document entitled **In Search of Promising Practices in Science Teacher Education** which would serve as the focus of a major AETS session in Detroit as a part of the National Science Teachers Association convention activities.

Later in the year ERIC/SMEAC funded a meeting of the Program Committee of the National Association for Research in Science Teaching. This meeting was spent in evaluating abstracts submitted for possible presentation at the 46th annual meeting of NARST to be held in Detroit, March 26-29, 1973.

An additional meeting of the AETS Publication Committee was funded for February, 1973. At this time the committee members met for the purpose of editing the program descriptions submitted for publication in the "Promising Practices" document and to plan the final details of the Forum meeting.

Although the specific activities change from year to year, this summary is indicative of the interests and concerns of the Science Education division of ERIC/SMEAC.

SE 017 935

Compilations of ERIC Abstracts and MicroLibraries

The ERIC Center for Science, Mathematics, and Environmental Education and the Center for Science and Mathematics Education at The Ohio State University, Columbus, Ohio, are cooperating with Education Associates, Inc., of Worthington, Ohio, and Microfiche Publications, a division of Microfiche Systems Corporation of New York, to produce compilations of ERIC abstracts and a series of micro-libraries containing microfiche of selected documents listed in the compilations.

COMPILATIONS

Three compilations will be available in June. One will be devoted to science education, a second to mathematics education, and a third to environmental education. Each compilation will include a comprehensive collection of abstracts of documents that have been announced in **Research in Education** for 1966-1972. Also included in each will be an author index and a subject index. These compilations will enable rapid manual searches of the ERIC data base which includes research reports, instructional materials, teacher guides, curriculum guides, and resource materials. The science education compilation contains over 4,000 abstracts, the mathematics education compilation over 2,000 abstracts, and the environmental education compilation approximately 2,000 abstracts. The cost of each of the publications is less than two computer searches.

By ordering before June 1, 1973 you can purchase compilations at prepublication rates and save substantially.

The titles and the prices of the publications are listed below.

Science Education, A Bibliography of Abstracts from **Research in Education**, 1966-1972. Price after June 1, $22.00. Prepublication price, $18.00.

Mathematics Education, A Bibliography of Abstracts from **Research in Education**, 1966-1972. Price after June 1, $18.00. Prepublication price, $15.00.

Environmental Education, A Bibliography of Abstracts from **Research in Education**, 1966-1972. Price after June 1, $15.00. Prepublication price, $13.00.

Requests for orders or further information regarding the compilations should be directed to:

Education Associates, Inc.
P.O. Box 441
Worthington, Ohio 43085

MICRO-LIBRARIES

Microfiche micro-libraries will also be available for selected documents for each of the compilations. The compilations include indexes that can be used to search the micro-libraries by author, by subject area, or by ERIC document number. Four micro-libraries will be available for Science Education, four for Mathematics Education, and four for Environmental Education. For each area there will be an Elementary School Library, a Secondary School Library, and a Higher Education Library. Each library will contain between 300 to 500 titles including instructional materials, teacher guides, curriculum guides, and research reports of interest to that level of education. The price of each library will be under $200.00 (approximately $0.40 per title). This is a very inexpensive way to acquire materials for a college, school, or professional library. Special prepublication rates on the micro-libraries will also be available through June, 1973.

Requests for orders and further information should be directed to:

Mr. Arthur Kramer
Microfiche Publications
305 East 46th Street
New York, New York 10017

Recent Publications

The following are documents recently produced by ERIC/SMEAC. A brief abstract is included for each document along with information for ordering copies from EDRS. A form and information on ordering procedures for EDRS documents will be found elsewhere in this newsletter.

ED 059 913

Helgeson, Stanley L. and Others
A Review of Environmental Education for Elementary and Secondary School Teachers, Volume I of III. Final Report.
Ohio State Univ., Columbus. Research Foundation, 1971.
Spons. Agency—National Center for Educational Research and Development (DHEW/OE), Washington, D.C.
Bureau No.—BR-1-0277
Grant—OEG-0-71-2732
EDRS Price MF $0.65 HC $6.58 186 pp.

This report, one in a series of three, is designed for elementary and secondary school teachers to familiarize them with the field of environmental education. Following a general orientation, specific problems and needs are identified and research related to these is noted. Current practices concerning environmental education programs and materials are summarized together with recommendations regarding their development and implementation. Brief descriptions of selected programs and materials and case studies describing program development and implementation are included. Sources of information for supplementary materials are also listed. A copy of the Environmental Education Curriculum Analysis Instrument, along with a summary of learning approaches to environmental education, concludes the work. This publication is the result of a cooperative project by the ERIC Clearinghouse for Social Studies/Social Science Education (ChESS), Boulder, Colorado, and the Clearinghouse for Science, Mathematics, and Environmental Education (SMEAC), Columbus, Ohio. For similar documents related to teachers of the urban/disadvantaged and school administrators see ED 059 914 and ED 059 915.

ED 059 914

Helgeson, Stanley L. and Others
A Review of Environmental Education for Teachers of Urban/Disadvantaged, Volume II of III. Final Report.
Ohio State Univ., Columbus. Research Foundation, 1971.
Spons. Agency—National Center for Educational Research and Development (DHEW/OE), Washington, D.C.
Bureau No.—BR-1-0277
Grant—OEG-0-71-2732
EDRS Price MF $0.65 HC $6.58 167 pp.

ED 059 915

Helgeson, Stanley L. and Others
A Review of Environmental Education for School Administrators, Volume III of III. Final Report.
Ohio State Univ., Columbus. Research Foundation, 1971
Spons. Agency—National Center for Educational Research and Development (DHEW/OE), Washington, D.C.
Bureau No.—BR-1-0277
Grant—OEG-0-71-2732
EDRS Price MF $0.65 HC $6.58 178 pp.

ED 059 918

National Association for Research in Science Teaching, 45th Annual Meeting, Abstracts of Presented Papers.
ERIC Information Analysis Center for Science Education, Columbus, Ohio, 1972.
EDRS Price MF $0.65 HC $6.58 199pp.

Abstracts of papers presented to the 45th Annual Meeting of the National Association for Research in Science Teaching are arranged according to the topic for the sessions at which they were presented. Series of sessions were devoted to test and instrument development, evaluation, learning theory, verbal behavior, instructional methods and materials, student achievement, and teacher preparation. Single sessions were held for the presentation of research papers on teacher characteristics, student characteristics, and the history and philosophy of science. Abstracts of addresses to general sessions (on various aspects of science education research) by Raths, Sutman, and Broudy are included, as well as lists of the participants in two symposia (environmental education and the problems of beginning teachers). Papers on elementary, secondary, and college level science education are included for most topics.

ED 059 887

Welch, Wayne W.

Review of the Research and Development Program of Harvard Project Physics.

ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, Columbus, Ohio, 1971.

EDRS Price MF $0.65 HC $3.29 35 pp.

The purpose of this paper is to summarize and review the results of the Harvard Project Physics (HPP) research and evaluation activity to make available to interested science educators the design, implementation, and results of a major curriculum evaluation effort. This activity was conducted during the years 1965-1970 and had considerable support from the U.S. Office of Education. The findings are summarized as follows: (1) Methodology; (a) Various cognitive, affective, and behavioral measures used as criteria, (b) Pilot test of design and instruments, and (c) Implementation on a national random sample; (2) Teachers; (a) Characteristics of physics teachers, (b) Effects of participation in the program; volunteer teachers in the program were different than the randomly-selected group; and participation in summer institutes did change attitudes but not nearly as much as actually teaching the HPP course; (3) Students; (a) Characteristics, (b) Student learning and the effects of teacher characteristics, amount of instruction, and the HPP course, (c) Enrollment with regard to text used, teacher attitudes, and grading practices; and (4) Research on learning environments. The development of the Learning Environment Inventory (LEI) is described. The final evaluation found that students rated HPP lower than "other physics" on difficulty, mathematics, and applied, but higher on satisfaction, diversity, history, philosophy, humanitarianism, and social. A summary of the significant findings is given as well as an extensive bibliography.

ED 059 900

Walbesser, Henry H. Eisenberg, Theodore A.

A Review of Research on Behavioral Objectives and Learning Hierarchies.

ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, Columbus, Ohio, 1972.

Available from—Ohio State University, Center for Science and Mathematics Education, 248 Arps Hall, Columbus, Ohio 43210 ($1.25 plus $.25 handling).

EDRS Price MF $0.65 HC $3.29 82 pp.

In the first part of this paper, the purposes of behavioral objectives are outlined; research is then summarized, including the influence of knowledge of the behavioral objectives on a learner's performance, teacher recognition of behavioral objectives, and student attitudes to behavioral objectives. The second part presents a summary of methods of constructing learning hierarchies. The research topics outlined include the structure and efficiency of expert versus student generated hierarchies, relationships between performances on adjacent levels of a hierarchy, and the psychometrics of learning hierarchies. Each part of this paper contains a table of the research hypotheses investigated, with a listing of supporting and non-supporting experiments reported. Although most of the research reviewed refers to mathematics and science, studies in other areas are also included.

ED 062 107

Lucas, A. M.

ASEP—A National Curriculum Development Project in Australia.

ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, Columbus, Ohio.

EDRS Price MF $0.65 HC $3.29 18 pp.

Identifiers—Australian Science Education Project.

A brief outline of the Australian educational system, emphasizing the organization of science education in the various states, provides the framework for a description of the origin, role, and function of the Australian Science Education Project (ASEP) established jointly in 1969 by the Federal and State governments. The aims of the project, all consistent with the broad aim "to design science experiences which contribute to the development of children" are listed, and the relationship of the environmental and social themes to the aims and procedures of ASEP is discussed. Criteria for the selection of topics to be developed are illustrated by synoptic descriptions of some tentatively planned units. Brief comments on the involvement of teachers and planned formative evaluation of the units are made, and the intended open-ended and open-sided nature of some units is discussed. The project will terminate in 1973 when units will be available for use in grades seven through ten.

ED 068 317

Mayer, Victor J. Wall, Charles

Research in Earth Science Education: An Annotated Bibliography.

ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, Columbus, Ohio, 1972.

Note—SMEAC Special Bibliography 6

EDRS Price MF $0.65 HC $3.29 47 pp.

Descriptors—*Annotated Bibliographies, *Bibliographies, Curriculum, *Earth Science, *Environmental Education, *Environmental Research, Science Education, Science Instruction.

This special bibliography on research in earth science education from the ERIC Center for Science, Mathematics, and Environmental Education provides a list of books which will be useful for educators interested in the field. The period covered in this publication is through the end of 1971. Annotations are given for each item. The sources covered in the publication are doctoral dissertations, educational journals, and the materials in the Educational Resources Information Center (ERIC) System. The bibliography is arranged in five parts: elementary, secondary, college, qualifications of secondary school earth science teachers, and museums and planetariums as educational institutions.

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1250—RF-2228
Science Education—Volume 5, Number 1, 1973

ED 068 359

Roth, Robert E. Helgeson, Stanley L.

A Review of Research Related to Environmental Education.

ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, Columbus, Ohio, 1972.

Available from—Center for Science and Mathematics Education, The Ohio State University, 244 Arps Hall, Columbus, Ohio 43210 ($1.50 plus $0.25 handling).

EDRS Price MF $0.65 HC $3.29 56 pp.

To achieve the goals of environmental quality, new thrusts have been placed upon environmental education. Although successful development of this process must be based on sound research, little attention has been given to searching out, organizing, and reporting research in the environmental education area. The purpose of this report is to: (1) identify known research pertaining to environmental education, (2) review critically the identified research, and (3) identify areas for further research. Studies selected (94) include: (1) attempts at objective evaluation of programs, outcomes, attitudes, and administrative procedures, and (2) works related to elementary-secondary school, college or adult levels of educational concern. The review is limited to research completed since 1950 with the exception of certain documents of historic significance. Summary statements indicate that researchers addressed themselves to numerous aspects of environmental education, such as problems of philosophy, program development, evaluation of instructional materials, selection of sites appropriate for learning, and outcomes of programs. None of them, however, appeared to have considered environmental education on other than a local, regional, or national basis. The reviewers felt if environmental education is to be truly effective, it must emphasize the worldwide nature of the problems.

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SMEAC
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NEWSLETTER
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Center Comments

New Publications to Replace Newsletter

Due to governmental restrictions on printing, the growth in demand for the three newsletters from this Center, and the large number of requests by people for special information, we are discontinuing publication of our three newsletters and replacing them with fact sheets and bulletins directed to specific audiences. These publications will be published on selected topics and will present information of interest to specific audiences. We believe we can serve the large number of people who use our newsletters and who request information from the Center more effectively by this procedure.

A mailing request form for these free publications is on page three of this newsletter. Please be sure to complete and return the form if you want to receive the new publications. Our current mailing list will be scanned to maintain libraries and professional associations. Individuals or other groups must return a request for the new service.

Topics for the fact sheets and bulletins are being selected from information requests received at ERIC/SMEAC. If you have suggestions for topics, please send such ideas to us with the mailing form.

Mrs. Beverly Lee

Many of the people who have worked with the ERIC/SMEAC staff, requested information from the Center, and attended conferences where ERIC/SMEAC participated, met Mrs. J. Robert Lee. Beverly was a Research Associate in Environmental Education and active in many activities of the Center.

We were all deeply saddened by her death in November, 1973. She was an outstanding worker, a good friend, and one who worked hard to make the world a better place to live.

Robert W. Howe
Director

If you desire to continue to receive information from ERIC/SMEAC, complete and return the Mailing List Request Form on page 3.

Living Laboratory Experiences Module Available

"LIVING LABORATORY EXPERIENCES—a multimedia resource kit that can be almost anything a teacher wants it to be," is the way that Singer's Society for Visual Education (SVE) describes its modular package for intermediate and junior high grades.

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Each of the three kits concerns two famous men and four experiments. The scientists and inventors involved include: Percy Lavon Julian/Elijah McCoy; George Washington Carver/Norbert Rillieux; Garrett A. Morgan/Charles Drew. Under the direction of the tape tutor, students use solutions, beakers, tripods furnished in the kits to perform experiments on filtration, synthesis, vaporization, etc.

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Each kit contains a back-to-back cassette, illustrated directions for four experiments, two two-color posters, two pads of different quizzes of 100 sheets on each of the men and their work, two Teacher's Manuals, and all the materials and equipment for carrying out four experiments.

The individual kits covering two scientists each are priced at $35.00 each. The complete LIVING LABORATORY EXPERIENCES modular package containing the three kits is available at $100.00. For a free full-color catalog sheet on LIVING LABORATORY EXPERIENCES, write:

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SE 017 935

SCIENCE MATERIALS AVAILABLE FROM GREAT PLAINS NATIONAL TELEVISION LIBRARY

TWO NEW SCIENCE SERIES OFFERED BY TV TEACHER ROBERT CRUMPLER

TELL ME WHAT YOU SEE is a new science series designed for grade 1 and distributed by Great Plains National. SEARCH FOR SCIENCE (Revised) is a revision of a course by the same title for grade 4. Both series were produced by the ETV Association of Metropolitan Cleveland, WVIZ-TV and are taught by Robert Crumpler.

This series of programs is the result of apparent need for a unit of study dealing with the behavior and characteristics of animals. It is a serious effort to cause first grade youngsters to use and sharpen skills they already have; that is, the abilities to observe, to make comparisons and to draw conclusions.

Both of these series are available in color on video tape and U-Matic Videocassette. Lesson titles for both new series follow.

Pre-selected lessons from TELL ME WHAT YOU SEE and SEARCH FOR SCIENCE (Revised) are available for no-cost, no-obligation previewing from GPN on either color quadruplex viewo tape, 16mm black and white kinescope or color U-Matic Videocassettes. The previewing package also includes a returnable copy of a teacher's guide for the series.

TELL ME WHAT YOU SEE (12/15 minute lessons)

1. All Kinds of Animals
2. Coral Life
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6. What Can Birds Do?
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12. Looking Back

SEARCH FOR SCIENCE (Revised) (32/15-minute lessons)

1. Scientific Method
2. Adaptation (Food Web)
3. Fish Adaptation
4. Fish and Its Survival
5. Birds/Adaptation
6. Birds—How We Change the Numbers
7. The Earth and the Moon
8. The Solar System
9. How We Get into Space
10. Space Exploration
11. The Microscope
12. The Ocean—A Different Kind of Animal
13. The Ocean—Animal Relationships
14. The Ocean—Always the Weak and the Strong
15. Mechanical Electricity
16. Chemical Electricity
17. Conductors and Non-Conductors
18. Series and Parallel Circuits
19. Magnetism—Part 1
20. Magnetism—Part 2 (Motors)
21. Properties of Air
22. Air in Motion
23. Air: Hot and Cold
24. Water Cycle
25. Balanced Flight—Part 1 (Lift)
26. Balanced Flight—Part 2 (Lift & Thrust)
27. Balanced Flight—Part 3 (Thrust/Drag/Gravity)
28. Photosynthesis
29. The Stomate
30. Respiration and Transpiration
31. Tropism—Part 1
32. Tropism—Part 2

HEAT: FILMS FOR SECONDARY LEVEL AVAILABLE

The teaching scheme of HEAT consists of carefully planned and presented experiments, models, film, diagrams and, where appropriate, animated calculations. The films were produced by the Centre for Educational Television Overseas (now the Centre for Educational Development Overseas) in London, England.

The programs of HEAT are versatile. Classroom teachers may wish to use them as introductions to topics, following with any expansion or consolidation deemed necessary. In situations where shortage of teachers or laboratory facilities makes science teaching difficult, the programs of HEAT may be used, in themselves, to provide solid fundamental teaching.

The titles are:

1. Hot Or Cold?
2. Temperature
3. Thermometers
4. Expansion
5. The Gas Laws
6. The Calorie
7. Joules And Calories
8. Latent Heat
9. Heat Transfer
10. Vapor Pressure

A Program Guide accompanying the series offers suggestions in the important areas of preparation, followup and class activities.

Sample previews of typical pre-selected lessons (numbers 1 and 6—see listing) from HEAT are available only on kinescope (film). A sample copy of the Program Guide may also be obtained for evaluation from Great Plains National.

MATERIALS FOR ELEMENTARY SCHOOL SCIENCE

Science for Second Graders

"Science is Everywhere" is a series of 32, 15-minute lessons designed to expand upon second graders' understandings of the major conceptual schemes of science. Each lesson is developed around a main theme. Lessons are grouped into general areas of study.

The series includes the following lessons and main themes: Lessons 1-3, "The Very Small" (molecules); 4-6, "Molecules at Work"; 7-9, "Fuels at Work" (green plants, sun, fuels); 10-13, "Silence and Sound"; 14-16, "Darkness and Light"; 17-21, "The Very Large" (planets and the universe); 22-25, "Plants Live and Grow"; 26-29, "Animals Live and Grow"; 30, "Millions of Years Ago and Now"; 31-32, "Stories for a New View: The Earth's Plants."

The series was produced by the Departments of Educational Broadcasting and Mathematics and Science Education of the Detroit Public Schools and are distributed by the Great Plains National Instructional TV Library. Pre-selected lessons may be previewed on either quadruplex video tape, video cassette, or 16 mm kinescope. The previewing package includes a returnable copy of the teacher's guide.

Living In A Nuclear Age

Another product distributed by the Great Plains National Instructional TV Library is a series of six, half-hour color programs entitled "Living in a Nuclear Age." All programs are about the atom and its effect on our lives.

The series was designed for seventh and eighth grade students but may also be used at the intermediate grade levels. It deals with the benefits, dangers and safeguards of the nuclear age. Scientific information is provided along with a look at the role of nuclear energy in current social issues.

The programs are entitled: "Discovering the Atom," "Power from the Atom," "Radioisotopes," "Nuclear Energy and Living Things," "Society and Things Nuclear" (Civil Defense, waste disposal procedures, etc.), "Bombarding Things."

Complete resource kits are available. The series may be purchased or leased from GPN on 16mm film, ¾-U video cassette, and a wide variety of videotape formats.

People interested in previewing any of the series should contact:

Great Plains National Instructional TV Library
P.O. Box 80669
Lincoln, Nebraska 68501
(Area Code 402, 467-2502)

Air Age Education Resource Centers Now Established

Resource centers to assist in providing information about air age education have been established at 60 colleges and other educational institutions by Cessna Aircraft Company's Air Age Education Department.

The colleges and institutions have agreed to maintain reference files for various air age education materials produced by Cessna. The information will be made available to interested educators who need help and advice on establishing air age education programs, primarily at the elementary and secondary levels.

The overall goal of the program is to establish a direct communication channel at the local level which will offer expert advice and information based on the educational experience of the institution in aerospace education.

Cessna Aircraft Company offers complete materials for establishing a credit course in aviation education at the high school level and also offers an extensive elementary school kit which helps teachers integrate aviation education into classroom experiences at all grade levels.

For additional information:
Cessna Aircraft Company
Air Age Education
Box 1521
Wichita, Kansas 67201
Phone: (316) 685-9111

MAILING LIST REQUEST FORM

The ERIC Information Analysis Center for Science, Mathematics, and Environmental Education produces fact sheets and bulletins for several interest groups. If you would like to be placed on our mailing list, complete and return this form. You may select your areas of interest in item one and then check which category in item two indicates your position or interest area.

1. Please indicate areas of interest:
   ___Science Education ___Mathematics Education ___Environmental Education
2. This item indicates the categories that will be used for special mailings. Please check your position and/or interest area.

Elementary School	Secondary School	College or University	Other
___a. Librarian (receives "b" and "c")	___a. Librarian (receives "b" and "c")	___a. Librarian (receives "b" and "c")	___a. Business and Industry
___b. Teacher	___b. Teacher	___b. Teacher	___b. Government
___c. Administrator or Supervisor	___c. Administrator or Supervisor	___c. Administrator or Supervisor	

3. Name _____
   Address _____
   City _____
   Zip Code (for U.S.) _____ State _____
   Foreign Country _____
4. Current Position
   Title _____

Clip and mail to: ERIC Information Analysis Center for
Science, Mathematics and Environmental Education
1800 Cannon Drive
400 Lincoln Tower
Columbus, Ohio 43210

Bell Science Kits Available

COMSPACE CORPORATION has received exclusive manufacturing and sales rights to a series of five science kits, designed and developed by Bell Telephone Laboratories. This five-program offering was developed to help teachers present important new fundamental concepts in the physical sciences. They were planned to narrow the gap between the research laboratory and the classroom, and were designed to assist in the presentation of curriculum material in physics, chemistry, biology and ecology.

The kits are:

Program #1—"From Sun to Sound" (a science kit).

All the components necessary to build a transistorized, solar-power oscillator are included. An equally important part of this kit is a book, written by George T. Frost, of Bell Laboratories, which discusses the theory of transistors, solar cells, transformers and capacitors, and is particularly geared for individual student involvement. ($7.95 each)

Program #2—"Solar Energy Experiment" (a science kit). This experiment is for use in the school laboratory under a teacher's supervision. The kit contains all the materials a student needs to make his own solar cell. In fact, it provides him with all he needs to make four solar cells. Students working with this experiment engage in a creative process that only a few years ago required million-dollar research and specialized research personnel. This program likewise contains a comprehensive book written by Dr. Daryl Chapin, one of the co-inventors of the Bell Solar Battery. This program is for individual student involvement. ($14.95 each)

Program #3—"Speech Synthesis" (a science kit). Essentially, this is a format generator, capable of combining three different format frequencies into a single output. The student can vary the frequency of any of the three formats by substituting different values of capacitance in the format generator circuits. This means that he can build a synthesizer to produce any vowel sounds he wants. The manual accompanying this kit suggests experiments that demonstrate some of the acoustic and psychological factors involved in speech perception. The text also explains the importance of speech and hearing. This program was created by Drs. Peter Denes, Albert Pinson and Cecil H. Coker, Bell Laboratory scientists, who have devoted many years to studying the nature of speech. This program is for individual student involvement. ($14.95 each)

Program #4—"Experiments with Crystals and Light" (a science kit). Experiments with Crystals and Light is a crystal experiment for the advanced student. Crystals and Light explains the interaction of crystals and polarized light waves. Basically, this kit contains 12 rigid cardboard pieces, polarized film and lenses which can be assembled into an efficient polarizing microscope. Also included in this kit are samples of mica, calcite, ADP and several other crystalline materials, plus a book entitled "Experiments with Crystals and Light." This book details 35 experiments which can be done with the polarizing microscope contained in this kit. The kit is the creation of Dr. Elisabeth A. Wood of Bell Laboratories, a well-known authority in the field of crystallography. This kit is for individual student use. ($14.95 each)

Program #5—CARDIAC (CARDboard Illustrative Aid to Computers). This is a manually operated cardboard computer. Its repertoire of ten instructions enables it to solve surprisingly difficult problems. It is accompanied by a 53-page illustrative manual which explains CARDIAC in terms of real computers and leads the student through ten programs. These range from a program of simple addition to a complex game playing program. CARDIAC is designed for individual student involvement. ($2.50 each)

If you are interested in incorporating this science series, or any part thereof, into your curriculum or to use it as part of an enrichment program, kindly contact COMSPACE CORPORATION, Science Department, 350 Great Neck Road, Farmingdale, L.I., N.Y. 11735, for further information.

NAEP Report on Science Available

The final version of "Report 7, 1969-70 Science" is now available. For the nonstatistician the report offers some clear explanations of what can and cannot be learned from NAEP results.

Group results by percentage of success on all exercises are given for race, parental education and size and type of community. Balanced results are given for those groups as well as geographical region and sex.

The concept of balancing as used by the NAEP Analysis Advisory Committee is explained and applied to the results. What it does is adjust the data so that comparisons can be made between the five groups.

"For each group, we discuss differences as we estimate they might have been if the other four characteristics had been proportionately represented in each group," the report states.

The report can be ordered from:

Superintendent of Documents,
U. S. Government Printing Office,
Washington, D.C. 20402.

Pennsylvania Publishes Revised Guide

A 1973 revision of Earth and Space Science, A Guide for Secondary Teachers has been published by the Bureau of Curriculum Services of the Pennsylvania Department of Education. The guide contains five units: 1. The Earth; 2. The Oceans; 3. The Space Environment; 4. The Atmosphere; and 5. The Exploration of Space. Unit 3 gives teaching information on astronomy, astronomical measurements, nature of stars, galaxies, types of stars, and the like. Unit 5 deals with the history of space flight, unmanned and manned space missions, including a summary of Apollo program. The guide is not a course of study, but places emphasis on the basic fundamentals, with some of the material written primarily for the teacher.

Copies are free to teachers in Pennsylvania. Others may purchase copies from the Office of Publications, Pennsylvania Department of Education, Box 911, Harrisburg, Pennsylvania 17126.

ESTPP Changes

Last fall the Earth Science Teacher Preparation Project moved from Boulder, Colorado, to Clarion, Pennsylvania. John Thompson has taken a position with Clarion State College and heads a year-round, flexible school. Correspondence concerning ESTPP should be sent to John Thompson at:

Research-Learning Center
Clarion State College
Clarion, Pennsylvania 16214

Regional ESTPP Centers have also been established. The Centers and the contact person for each are listed below:

Southwest: Bob Hanss, Department of Geology, St. Mary's University, 2700 Cincinnati Avenue, San Antonio, Texas 78228.

North Central: Eric Clausen, Director, Experimental College, Minot State College, Minot, North Dakota 58701.

Kansas: Tom Bridge, Department of Physical Science, Kansas State Teachers College, Emporia, Kansas 66801.

Colorado: Dick Dietz, Department of Earth Sciences, University of Northern Colorado, Greeley, Colorado 80631.

Oklahoma: John Risch, School of Geology and Geophysics, The University of Oklahoma, Norman, Oklahoma 73069.

Northeast: Bill Elberty, Department of Geology and Geography, St. Lawrence University, Canton, New York 13617.

Southeast: John Carpenter, Department of Geology, University of South Carolina, Columbia, South Carolina 29208.

ES Moves to Olympia, Wash.

Environmental Studies (ES) has changed its name as well as its location. Now called ESSENTIA, the project has moved from Boulder, Colorado, to Evergreen State College, Olympia, Washington. Under funding from the National Science Foundation and with sponsorship from Evergreen State College, ESSENTIA will concentrate on meeting the needs of teachers who will use the ES materials. ESSENTIA will be directed by Bob Sluss of the Evergreen State College staff and by Bob Samples.

The project's mailing address is ESSENTIA, The Evergreen State College, Olympia, Washington 98505.

NEW CENTER ESTABLISHED

SAPIENS, the National Center for Humanistic Environments, has been established by the ES staff to continue their work in humanism in all areas of society. The new, nonprofit corporation will continue the research and development of models and processes for creating more humane environments. Individuals wishing more information on the Center should write to Bob Lepper or Gail Griffith at the Center for Humanistic Environments, Box 4612, Boulder, Colorado 80302.

NASA Classroom Films Available

Twenty short "single concept" educational films are now available for classroom use, with each film accompanied by a teacher's guide. The films include views of rocket launches, the first walk in space, activities in exploring the surface of the Moon, descent and ascent of the Lunar Module, lunar samples, views of the Moon and Earth from orbit, dropping of a feather and wrench in the vacuum on the lunar surface, behavior of objects in an orbiting spacecraft, satellite pictures of the movement of cloud cover over Earth, and satellite views of Mars.

These films may be used to illustrate science principles in physics, physical science, earth science, meteorology, and other content areas. The average running time per film is about three and one-half minutes. The films are in color, without sound.

Persons interested in purchasing any of the films or in having more details should write:

The American Association of Physics Teachers
Drawer AW
Stony Brook, New York 11790

Fourth Annual UAP Conference

The University Affiliated Program at Children's Hospital of Los Angeles and the USC School of Education are co-sponsoring a one-day conference at Edison Auditorium of the University of Southern California on *Piagetian Theory: The Helping Professions and the School Age Child* on February 15, 1974. A major address will be given by a well known Piagetian scholar, Dr. Peter H. Wolff, Professor of Psychiatry at Harvard Medical School. Recent films dealing with Piagetian concepts will be shown. The afternoon session will include student papers and Piagetian test demonstrations. Monographs containing the papers of the Second and Third conferences are available at a small fee. Information regarding the conference papers may be obtained by writing:

Piaget Conference Committee
University Affiliated Program
Children's Hospital of Los Angeles
P.O. Box 54700
Los Angeles, California 90054

Audio Cassettes of International Scientific Conference

Last spring an International Conference of Scientific Unions was held at the Science Teaching Center of the University of Maryland. Representatives from foreign countries met with American science educators to discuss international programs and problems in science teaching. The proceedings of this conference are now available as a set of audio cassettes and include major presentations from the meetings. Speakers include representatives from UNESCO, Dr. John Maddox from *Nature*, Dr. John Goodlad from UCLA, and Professor Pentz of the United Kingdom. The set of tapes sells for $50.00, with portions of this money being distributed to UNESCO and the International Conference of Scientific Unions. Schools and libraries wishing to purchase the cassettes should write:

ISCU
P.O. Box 23
Hyattsville, Maryland 20781